A Naval Safety Center Publication

approach

NOVEMBER 1971 THE NAVAL AVIATION SAFETY REVIEW

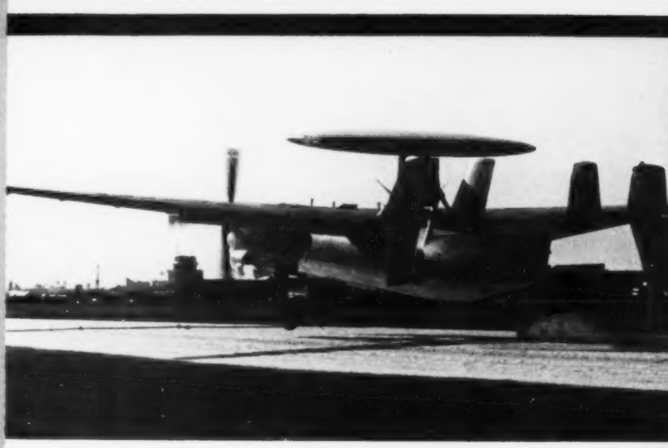
Dup

Professionals in Action

illus 1-4

AN E-2B pilot and copilot took off from homefield bound for a nearby outlying field to practice FMLP landings. Following a normal break, the aircraft was slowed to about 170 knots and the landing gear handle placed in the down position. The nose and port main mounts extended normally. The forward wheelwell doors for the starboard gear opened, but the gear did not come off the uplock, and the starboard gear indicator remained unsafe.

Several attempts at recycling the gear, while the aircraft was in a flaps-down configuration, produced the same results. Remaining in the Delta pattern over the outlying field, the pilots made several unsuccessful attempts to lower the right main landing gear by exerting both positive and negative G on the aircraft.



The combined and flight hydraulic system pressures were observed to be normal throughout the evolution. No hydraulic leaks were visible either from the cockpit or the CIC compartment. Two low passes were made over the LSO but no visual clues could be observed as to why the gear would not come down.

The pilot and copilot elected to return to homefield. Enroute, communications were established with squadron personnel. Qualified maintenance personnel and experienced E-2 aviators were soon on hand to provide assistance. NATOPS emergency procedures were reviewed with the pilots. An attempt at blowing the gear down was made without success. Further attempts to free the gear by the application of G force were also unsuccessful, as were specific recommendations for reselecting the landing gear down with the emergency gear lever. Finally, the problem was discussed with aircraft manufacturer's representatives and Naval Safety Center personnel but no effective procedure was found for lowering the gear.

At about 1500 local the fuel state was reported at 2.3 hours. A decision was made to begin foaming the runway at 1530 in preparation for a 1630 arrested landing. A strip of foam, 45 feet wide, was laid on the centerline of the duty runway from a point just before the E-28(b) arresting gear (located 3435 feet from the approach end of the runway) to a point 1500 feet upwind. The weather at this time was clear and the relative wind was 040 degrees at eight knots.

Prior to landing, the pilot made two simulated single-engine approaches to the arresting gear under the direction of the squadron LSO. Following the second approach and when established downwind, the copilot feathered the starboard engine and positioned the propeller 45 degrees from the vertical with the condition lever. The hook was lowered and the landing checklist completed. The aircraft touched down just in front of the arresting gear with the tailhook engaging the pendant shortly thereafter (see photos). After touchdown the pilot used full left aileron and full left rudder to hold the starboard wing off the runway as long as possible. The aircraft continued on centerline until the starboard wing contacted the runway resulting in a gentle starboard swerve. The swerve increased as the aircraft slowed and the aircraft left the foam 800 feet from the point of wire engagement. The E-2B stopped after 850 feet of arresting gear runout at a point 71 feet right of the centerline. The entire engagement and runout appeared to be smooth with no excessive forces on the aircraft. Only minor damage was incurred.

Postflight investigation determined that the landing gear malfunctioned due to maintenance factor, in that the timer check valve actuating roller assembly was not properly indexed.

The commanding officer stated in his endorsement:

"The pilot and copilot handled the emergency in a highly professional manner. The procedures used prior to and during the landing phase not only minimized the damage to the aircraft but averted what could have been a major aircraft accident. The cooperation and professionalism displayed by the control tower personnel and crash crew personnel contributed significantly to the orderly and successful termination of the emergency."

Here was a case of naval aviation professionals in action. Was this an isolated case? Not at all. Since July 1966 there have been no less than 196 cases wherein aircraft have been successfully landed following landing gear malfunctions which could not be corrected in the air. Thanks to the professionalism displayed by the pilots and support personnel, there was no loss of life in any of these cases. Moreover, in the great majority of cases, there was only minor damage to the aircraft.

Of course, the professionalism displayed by members

of the naval aviation team is not limited to intentional wheels-up landings. It is evident day to day over the whole spectrum of naval aviation operations. Here are some specific examples which have been gleaned at random from accident and incident reports.

Engine Failure After Takeoff

Shortly after takeoff in a TA-4J, while climbing through 500 feet, the pilot noted a "thump," immediate illumination of the fire-warning light and fumes in the lox system. An emergency was declared. The pilot turned downwind and set up for a normal landing. Fuel dumping was commenced. At the 90-degree position the engine began losing power and the 20 percent oil light illuminated. The pilot jettisoned his droptanks and raised his landing gear. At 100 feet, the pilot realized that he had the runway made. He lowered his landing gear again, secured the fuel dump and, immediately after touchdown, lowered his tailhook. The aircraft engaged the E-15 arresting gear at the approach end of the runway. The pilots exited the aircraft uninjured.

Postflight investigation is continuing, but it is believed that the engine failure was due to either simple turbine failure or internal FOD resulting in turbine failure. In any event, turbine blades separated and tore through both the engine casing and the skin of the empennage.

Here were a couple of *professionals* in action. Faced with a serious inflight problem, they quickly analyzed the situation and reacted in a most appropriate manner.

Bingo Evolution

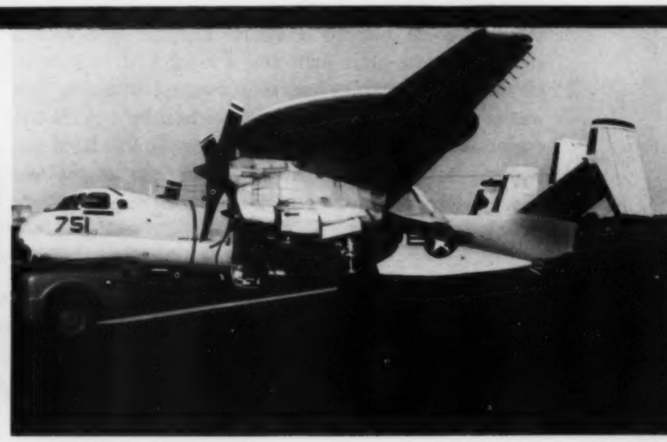
High winds, heavy seas and a marginal VFR day combined to make the recovery of aircraft aboard a CVA in the Gulf of Tonkin a somewhat frustrating experience. After several "almost traps," an F-8 pilot was directed to refuel from the A-7 tanker overhead and return to try again at getting aboard the pitching "27 Charlie" deck. After several more passes, a flopping tailhook made an arrestment seem unlikely, so the *Crusader* was bingoed to an incountry divert field about 80 miles away. The A-7 tanker was sent along as an escort – and to pump up the F-8 – as the weather over the beach was reported to be IFR with a thick overcast topping out at over 16,000 feet.

The fighter pilot and his attack wingman discussed their plans for arrival at the divert field on tactical frequency before contacting approach control. After determining that the destination weather was 200 feet overcast, three-fourths mile visibility in rainshowers and gusting winds, the two pilots agreed to make a closed section approach. It was to be a precision final approach for the fighter with the A-7 taking a missed approach and returning to the ship when the F-8 was safely on deck.

A random radar-controlled, speedbrakes-out descent was commenced from FL 225 with the *Crusader* in the lead. Passing 14,000 feet, still in the clag, the A-7 pilot saw the leader's wing lights go out and the external power package pop out. A quick lead change was performed and through standard hand signals, the A-7 pilot determined that the F-8 had experienced a complete electrical failure (including the emergency system) and had only 1800 pounds of fuel remaining.

The A-7 pilot informed approach control of the situation and requested priority for an approach and arrested landing for his wingman. After leveling at 5000 feet, the two aircraft were vectored overhead the field and then extended inland. This was necessary due to another emergency and a multitude of other low-state jets attempting to land.

The A-7 leader determined by his tacan that the flight was definitely over insecure territory and, by reference to his clock, calculated that the F-8 was now at minimum



fuel. He declared an emergency and turned towards a downwind leg for the duty runway. An overloaded approach control replied that there would be a 10-minute delay before an approach could be commenced for the section and the field made ready for an arrestment. The A-7 pilot replied that he was dropping gear and flaps, descending to intercept an abbreviated tacan approach and would report "meatball." He also stated that, in the event of a missed approach he would extend his drogue and attempt to refuel the F-8 while taking the flight "feet wet" for another approach or possible ejection. Meanwhile, the F-8 pilot was frantically signaling his desire to land.

At three miles, a GCA controller began to give the section a precision approach. The A-7 lead maintained a fast chevron angle-of-attack and a bore-sighted glidepath. At 200 feet and one-half mile, the runway and a centered meatball appeared. The fighter continued to a final landing and a mid-field arrestment. The A-7 broke off, executed a missed approach and returned to the ship.

The air wing in question had made it easier for these two pilots to perform professionally in the clutch by seeing to it early in the cruise that pilots of all squadrons were standardized as to hand signals and were familiar with the basic characteristics of other aircraft in the air wing.

Fire in Flight

The pilot and RIO of an F-4B were part of a scheduled two-plane GCI flight. During the second intercept, the aircraft was in a starboard turn at 20,000 feet, 320 knots, 45 degrees angle-of-bank, when both crewmembers noticed blue smoke emitting from the air conditioning vents. The smoke was pungent and irritating to the eyes.

The pilot selected full cold air conditioning, then dumped cabin pressure and reseated the emergency vent valve which cleared the smoke from the cockpit. At the same time he noticed a master caution light with a check-hydraulic-gages light and a radar CNI cool light. He then saw the utility hydraulic pressure dropping. This was soon followed by a fire and overheat light in the left engine (which was set at 90 percent rpm). Idle RPM was selected in the left engine; however, the engine was secured 10 seconds later because the fire-warning light remained on. The fire-warning light went out about 30 seconds after the engine was secured.

During these events, engine instruments showed normal readings. Immediately prior to securing the left engine, the instrument readings were (idle RPM): 1100 PPH fuel flow, 490^0 EGT, 65 percent rpm, nozzle one-fourth open. Although the engine was secured, the fire-warning light came back on for five seconds on three successive occasions.

The pilot turned toward homefield while descending and maintained an airspeed of 380-400 knots in an attempt to blow out what he believed to be a residual fire from hydraulic fluid in the engine bay area.

The tower was informed of the emergency and a landing was planned for a runway with E-28 arresting gear. During the approach to the field, the wingman carried out a visual check for fire damage and smoke but observed no indication of either. Fuel was dumped and NATOPS procedures for a single-engine landing were completed. The pilot then executed an uneventful arrested landing.

The Board determined that pilot procedures, techniques or actions had no influence or effect upon events prior to the detection of smoke in the cockpit. However, the Board did note:

"Definite, prompt and knowledgeable execution of NATOPS and safety procedures from that point on definitely contributed to the safe and successful recovery of the aircraft and aircrew. Exposure to active, comprehensive safety and NATOPS programs, thorough knowledge and conditioned reaction to emergency procedures and aircrew coordination in review of the NATOPS pocket checklist insured that no mistakes or oversights of required procedures aggravated an already critical situation."

Summary

The events recounted are representative of the wide range of inflight situations which aircrews face from time to time in our world-spanning Navy. These pilots and the support personnel who assisted them were prepared for trouble when it came.

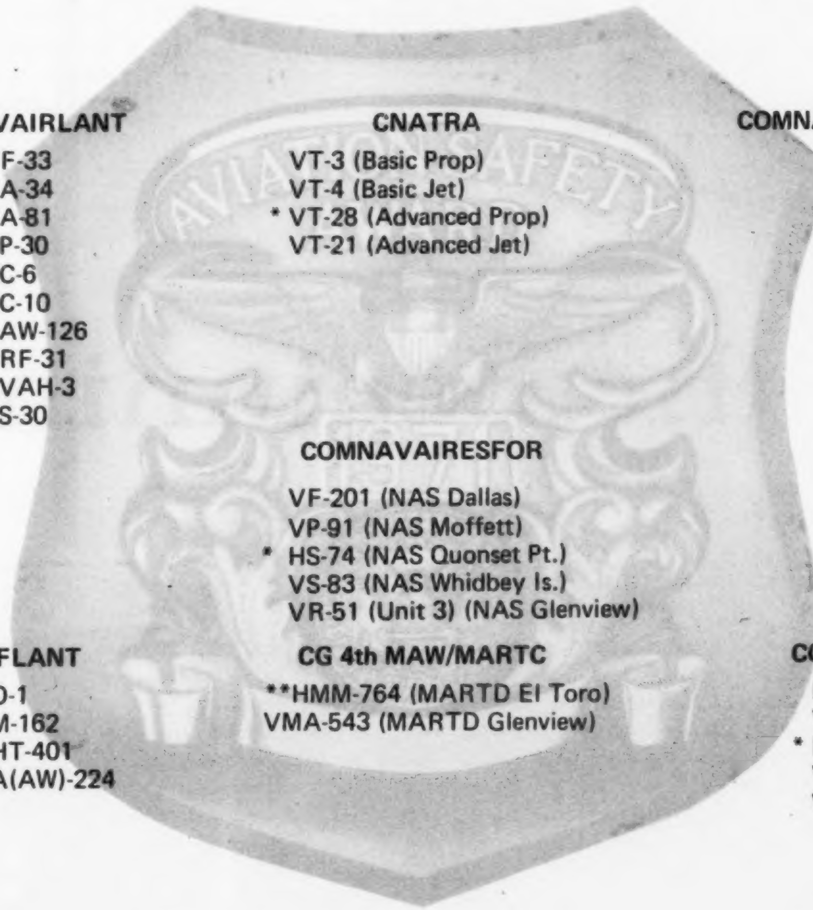
In short, this has been a brief look at naval aviation professionals in action. These are just a few of the men in the air and on the ground who, by their professional actions, have brought naval aviation accident rates down to the lowest point in its 60-year history.

Good show!

You must have long-range goals to keep you from being frustrated by short-range failures.

Charles C. Noble

CNO SAFETY AWARD WINNERS



COMNAVAIRLANT

VF-33
VA-34
VA-81
VP-30
HC-6
VC-10
VAW-126
VRF-31
* RVAH-3
VS-30

CNATRA

VT-3 (Basic Prop)
VT-4 (Basic Jet)
* VT-28 (Advanced Prop)
VT-21 (Advanced Jet)

COMNAVAIRPAC

VF-126
VF-213
VA-113
VA-115
VP-22
HC-3
VR-30
VC-7

COMNAVAIRESFOR

VF-201 (NAS Dallas)
VP-91 (NAS Moffett)
* HS-74 (NAS Quonset Pt.)
VS-83 (NAS Whidbey Is.)
VR-51 (Unit 3) (NAS Glenview)

CGFMFLANT

VMO-1
HMM-162
HMHT-401
VMA(AW)-224

CG 4th MAW/MARTC

**HMM-764 (MARTD El Toro)
VMA-543 (MARTD Glenview)

CGFMFPAC

HMM-163
VMGR-152
* HMMT-302
VMFA-212
VMA(AW)-225

ADMIRAL JAMES H. FLATLEY MEMORIAL AWARD

CVA	LPH	CVS
USS Kitty Hawk	USS Guam	USS Wasp
USS Hancock		

*Second Consecutive Year
**Third Consecutive Year

JACK CHILTON – Fighter pilot WW II. Pilot, Engineering and Inspection Officer, Bureau of Aeronautics Resident Representative, Douglas Aircraft 1952-1953. Now Head of Malfunction Analysis Branch, Engineering Division of Naval Air Systems Command Representative Pacific. Since 1961 responsible for the development of the Engineering Investigation Program of NAVAIRSYSCOMREPAC.

In the Beginning...

(Exchange of aircraft maintenance and material information)

By Jack Chilton

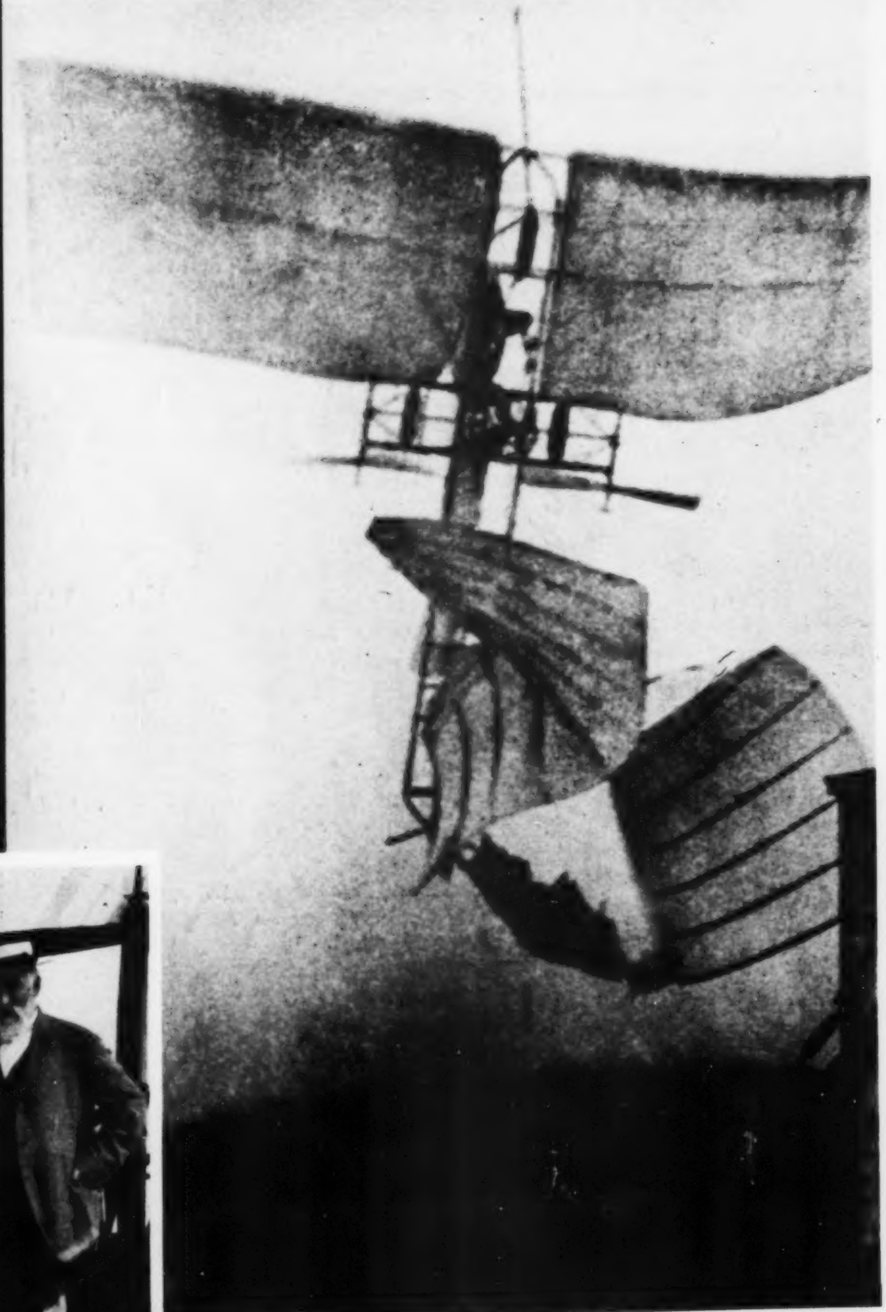
illus 6-8

FORTY miles downstream from Washington, on a modified houseboat anchored in the Potomac River, Charles Manly attached a compass to the left leg of his white duck trousers and donned a cork lifejacket. With apparent confidence, Manly stepped into the open oval car of the airplane. The engine had been running for some time and was apparently developing full horsepower. Manly waved to the crowd of newsmen and signaled for the launch. The machine moved smoothly along the 70-foot track which was mounted on top of the houseboat. To quote the Washington Evening Star, "The speed was not great, apparently not more than 40 or 50 feet a second. It took the air fairly well. For a fraction of a second the 'aerodrome' stood up in the face of the five-mile wind then blowing. The next instant the big and curious thing turned gradually downward. It disappeared beneath the waves."

Photographs made at the instant of launch showed the wings bending badly out of shape under the strain of lifting the 850-pound machine, but Dr. Langley, who had designed the craft, concluded that the crash had been caused by a failure in the launching device which caused it to snag the machine as it slid toward the takeoff point.

Two months later, now in the fall of 1903, having miraculously escaped injury in the first attempt (his *only* flight experience), Manly climbed aboard the rebuilt machine mounted on the same houseboat. This time, as the machine left the launching rail, the guy wires connecting its tail and rear wings apparently failed. The craft swooped upward, turned over and fell into the water. The aircraft came down on top of Manly, but he

At right, the white-bearded, Samuel P. Langley with his assistant and pilot Charles M. Manly (equipped with a compass on his knee), just prior to the first unsuccessful attempt at powered flight on October 7, 1903. In its second and final trial on December 8 (at far right), Langley's "aerodrome," again launched from a Potomac River houseboat, is seen falling apart and dropping into the water.



managed to escape a second time.[1] Obviously, Dr. Langley's investigation of the first crash had failed to identify the structural weaknesses of his flying machine. *

The Wright Brothers, who made the first powered flight nine days after Manly's second attempt, would probably have spotted Langley's design deficiencies. But competition, rather than cooperation, was the order of the day, and Langley didn't ask for assistance. It is somewhat doubtful that Langley would have listened to the Wright Brothers, even if they had offered help.

Obviously, if aviation was to continue, communications and failure investigation techniques had to improve, and improve they did – but slowly.

Systems for reporting equipment problems were established, modified, abandoned, reinstated and replaced. Each branch of the military established separate systems, as did commercial aircraft operations. Even now, it is hard to keep up with the rapid changes in these systems, and there is little exchange of information between them.

There are, however, some Navy systems which are durable. One of these is the Engineering Investigation Program, which has been in operation for 10 years and offers advantages which have brought about many equipment improvements. The program employs the best available skills and equipment to determine the cause of equipment weakness or failure, to select the most desirable way to correct these problems and to see that correction is finally brought about. The operation of the Engineering Investigation Program is described in some detail in NAVAIRINST 4730.5 and OPNAVINST 4790.2, Volume 3, Chapter 8, but a review of the methods and aims of the program may be illuminating.

When a request for Engineering Investigation is received by the Naval Air Systems Command Representative, it is tagged with a control number so that it can be followed through to a productive end. The data provided with the request is recorded, entered into ADP (automatic data processing) and put on file. Prior to assigning a control number, the request has received a thorough shakedown. If the failure or weakness exhibited by the equipment is thoroughly understood, if corrective action is completed or underway, or if the failure is currently under investigation and a sufficient number of failed units are already available, then additional investigation will be of little value. In such cases, the requestor will be notified and no control number will be assigned.

Usually, the investigation is assigned to the activity which is the designated overhaul point or cognizant field activity for the material under investigation. There are, however, more than 50 investigating activities being used, and each has unique capabilities which may make another selection more appropriate.

When the investigation is complete, the NAVAIRSYSCOMREP again records the data, retains it on file and enters it into ADP. He also checks the addressees on the report and makes sure that the requestor and the person who must take action to prevent additional failures of this type receive the report. The NAVAIRSYSCOMREP then assigns the investigation to a branch of his command which must follow through until corrective action is complete.

A partially computerized system of follow-up is employed to prevent bottlenecks from developing. Automatic data processing also makes it possible to produce a quarterly status report, titled "FACTS," which keeps the Fleet informed on the progress of these investigations toward solutions to aeronautical equipment problems.

An important advantage of the Engineering Investigation Program is that it brings together *all* investigations of equipment failures or weaknesses, and can correlate them by aircraft type and model, work unit code and part number, manufacturer, repair activity or in many other ways. All of these lead to earlier detection of the causes of failures and earlier solutions to equipment problems.

If identical investigations are going on in more than one place, say at a contractor's plant and at a naval air rework facility, the program brings these together for comparison, and this often means that a better problem solution results. This central control also prevents unnecessary investigations from occurring.

All investigations are now being manually correlated with 3M (Maintenance and Material Management) data to provide a more comprehensive data package to support corrective action. A computerized method of bringing together data from engineering investigations, 3M, design (maintenance engineering analyses), analytical rework, and URs (unsatisfactory reports) is under study. When this method becomes available, it will have significant effects on new designs, will improve operational capabilities and will provide justification for replacement of obsolete weapons systems.

1. Taken from *The First to Fly*, by Sherwood Harris, published by Simon and Schuster.

* A New York Times editorial derided Langley's design efforts as a "fiasco" commenting that it would be millions of years, if ever, before man would fly. – Ed.

Commander, Naval Safety Center recently received a letter from Deputy Inspector General for Inspection and Safety, USAF. The subject, "Explosives Contraband On Passenger Aircraft," is a serious one and prompted the following article.

The Zealot and the Ammunition

A ZEALOT is someone who has eagerness and an ardent interest in the pursuit of something. The zealot we're about to discuss is the type who goes to great lengths to bring unauthorized explosives into this country via military aircraft. As an example, on 30 June 1971, United States Customs Inspectors at Travis AFB, California confiscated the following explosives from the luggage of a member of our military services:

53 rounds, .45 cal.
2 rounds, 12 gauge Flechette
1 round, 9mm
19 rounds, CHICOM 7.65mm
41 rounds, CHICOM AK47 ammunition
109 MK140-D Signals
5 Personnel Distress Signals
41 Pen Gun Flares

This is just one example of many such incidents which have involved personnel from *all* military services. Apparently these personnel were not fully aware of the seriousness of their actions. In the instance described, the member's orders specifically stated that firearms, ammunition and explosives were restricted from luggage, yet he ignored these prohibitions. In many cases personnel are unaware of restrictions against such transport until confronted with this information at air terminals. Frequently they abandon the explosives contraband in or near the terminal which creates an additional unwarranted hazard.

This year there has been a considerable increase in the number of incidents in which military passengers have carried or shipped contraband explosives items on aircraft. Each occurrence jeopardizes the safety of military airlift passengers, crew, aircraft and terminal facilities. If personnel are not stopped from bringing explosives aboard passenger aircraft, then it will be only a matter of time before a catastrophe occurs. Overseas commands, especially those in southeast Asia, can help to eliminate this possibility by accomplishing the following:

Making it known to everyone in their command that explosives are not to be carried or shipped aboard passenger aircraft, military or civilian.

Instituting more stringent baggage inspection procedures.

Making personnel aware of the heavy fines and penalties (including imprisonment) which can be imposed on violators.

However, no matter what action is taken by those in authority, the cooperation of all hands is required if the air transport of explosives contraband is to be stopped. Those who have successfully smuggled hazardous contraband into CONUS are lucky insofar that they weren't caught in the act. Whether or not the particular explosives concerned will, in the future, cause tragedy – only time will tell. Those who are contemplating bringing ammo home to show the folks should think again. To date, there has been no transoceanic shuttle flight explode high over the Pacific. – Will your flight be the first?

The VWS pictured here is the evaluation model. The model currently under contract incorporates a number of modifications but the basic appearance is similar.

Ventilated Wet Suit

By Lionel Weinstock,
Project Engineer, Crew Systems Division,
NAVAIRSYSCOMHQ

illu 10-14

THE ventilated wet suit, which will eventually replace the Mk-5A antiexposure suit, is on its way. A contract has been let and the suit should be available in limited quantities in the very near future. First deliveries will go to the antisubmarine people – HS and VS pilots and aircrewmen – but more on this later.

Thanks primarily to electronic locator devices, the time a downed pilot or aircrewman spends in the water before he is picked up has decreased over the past few years. Currently, the interval from water touchdown to rescue is in the neighborhood of 15 minutes for carrier based aircrews. Maximum rescue time for the majority of all downed pilots and crewmen is 90 minutes.

This good news has had its effect on antiexposure suit design. When locating a survivor took hours or maybe even a day, antiexposure protection had to be long-term. The tradeoff was cockpit comfort and mobility. Now that rescue time has been shortened considerably, a new concept of antiexposure protection becomes feasible. NAVAIRSYSCOM tasked NAVAIRDEVCEN (Naval Air Development Center) to come up with a new antiexposure suit. The outcome of NAVAIRDEVCEN development, evaluation and testing was the conclusion that the basic skin diver's wet suit could be adapted to meet the Navy pilot's and aircrewman's requirements in antiexposure gear. These are, of course, immediate protection in cold water and constant wear comfort and

Auxiliary Exposure Equipment

Anti-G Suit Connection

mobility in the cockpit. The adaptation is known as the ventilated wet suit. Using the skin diver's wet suit principle of insulation and body warming of restricted cold water influx, the VWS is designed to protect the wearer from permanent physical injury under the following conditions:

- Expected rescue time equal to or less than 1 1/2 hours.
- Water temperature equal to or greater than 32°F.
- Air temperature equal to or greater than 20°F.
- Wind velocity equal to or less than 20 miles per hour.

Good Marks on Comfort

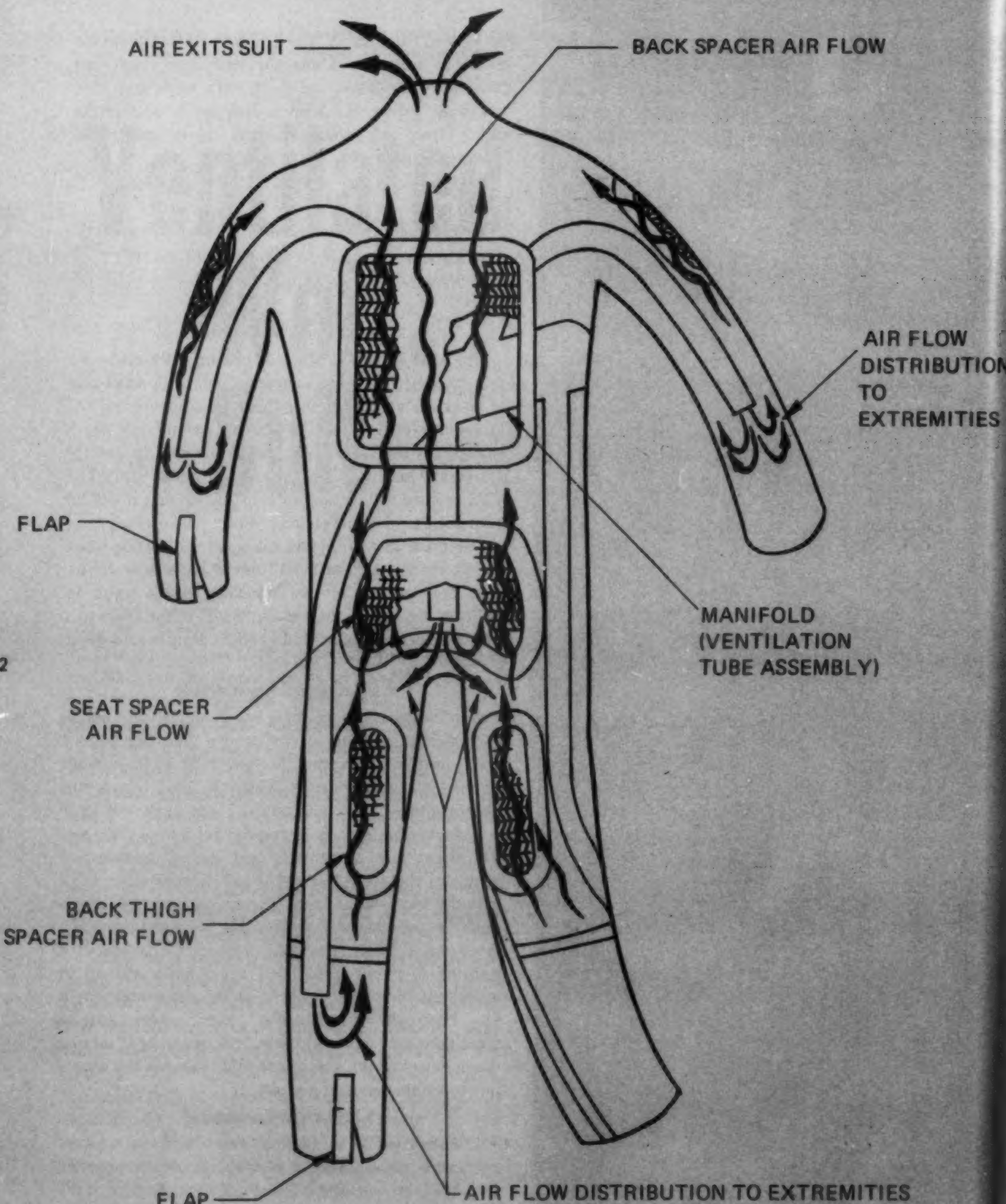
The VWS gets good marks on comfort. It is made of a thin layer of closed cell neoprene foam with small cells or air pockets which provide the suit's insulating quality. Lining the foam material is a stretch nylon fabric which strengthens the foam layer, makes it easier to put the suit on and take it off and increases wearer comfort. The VWS is loose fitting and so constructed that it will be most comfortable in a seated position. The neck opening has been cut low to prevent riding up and chafing when the wearer is seated and the front of the suit is shorter than the back to prevent bunching at the waist. In addition, the legs of the suit are "bent" at the knees to a neutral rudder pedal attitude of 120 degrees to prevent binding.

Insulating and Impermeable

The closed neoprene foam is a good insulator and is impermeable to both air and water. The foam retains body heat and moisture in hot, cold and normally comfortable environments. The suit has a ventilation system into which "conditioned," vent or blower air is introduced through a fitting on the left side of the chest. Air bleeds into a manifold and ducting system and ventilates the arms, legs and crotch. The air flows back over the body, around and through spacer panels which hold the suit slightly away from the body and then exits at the neck. With air flowing through the system at a rate of 6 to 12 cubic feet per minute and at an acceptable temperature and humidity, the wearer should be thermally comfortable. Even under adverse conditions such as low air flow, "unconditioned" air or a warm environment, the suit should maintain the wearer at a tolerable temperature level.

VWS Can Be Customized

The suit comes in 18 sizes and can, if required, be customized by reduction of the circumference and/or length of the arms and legs and the circumference of the torso. The suit must fit snugly so that a minimum volume of water is allowed to flow between the body and the foam coverall when the wearer is submerged. If



Coverall Ventilation System, Inside Back

water volume is too great, over an extended period of time it can unduly increase body heat loss.

In addition to the wet suit, the total antiexposure assembly consists of polyvinyl chloride underwear (Rhovyl), heavy wool socks, flight boots, nomex flight suit, antiexposure mittens and inflatable antiexposure hood.

Rhovyl Underwear

The Rhovyl underwear worn with the wet suit is lightweight and thin yet high in insulating value and almost completely non-water absorbent. Even when the wearer is submerged in cold water, the underwear provides another effective insulating layer next to his skin. During normal flight, the underwear allows perspiration to pass through the material to be evaporated by the air flowing through the VWS's ventilating system. Good marks for comfort here too – the underwear provides insulation equivalent to that of heavier cold weather underwear, such as the waffle-weave style, but feels like a cotton T-shirt.

For additional fire and "wear and tear" protection and to provide stowage space for the antiexposure mittens, hood and other necessary equipment, a modified nomex summer flight coverall is worn over the VWS. The anti-G suit can be worn over or under the VWS, but if it is worn over the suit a larger size is required, and the mittens and hood must be accessible for emergency.

A Little History

The current radical departure from the traditional dry "poopy suit" to a wet suit concept is not without precedent. As far back as 1961, two-piece wet suits were tried by an AIRLANT patrol squadron operating out of Newfoundland, Labrador and Greenland. Three years later, an AIRPAC antisubmarine squadron came up with feasibility results using a modified and ventilated diver's wet suit. Meanwhile, cold water exposure tests in the laboratories at the Naval Medical Research Institute demonstrated the superiority of the neoprene foam antiexposure assembly over the Mk-5A antiexposure suit for helicopter rescue aircrewmen. Rescue aircrewmen were subsequently authorized to wear the skin diver's two-piece unicellular foam wet suit.

As a result of the evaluation program, a one-piece neoprene foam coverall 3/16 of an inch thick, incorporating a full ventilating system, was designed and prototypes were flight tested at the Naval Air Test Center, Patuxent River. After recommended design changes were accomplished, NAVAIR, with the help of the APTUs (Aerospace Physiology Training Units), proceeded with a large scale program to determine the suit's operational suitability in different kinds of aircraft. A total of 3000 suits was procured and evaluated during the winter of 1969-70 by various types of deploying squadrons.

Foam a Little Too Stiff

As we have said, the first evaluation models were 3/16 of an inch thick. This is no longer true. As a result of fleet evaluation, fighter and attack communities found that the foam was a little too stiff and restricted overhead arm mobility. There were also reports that it increased fatigue because of the constant effort required to "bend" the arms of the suit. Another general criticism was that it was difficult to get a nomex flight suit over the VWS and, in some cases, the suit unduly restricted mobility in air-combat maneuvering. In addition, the special Rhovyl underwear was found to be vulnerable to excessive shrinkage when laundered at excessively high temperatures in ship's laundries.

Successor to the Mk-5A

On the basis of evaluation results, NAVAIRSYSCOM decided to adopt the VWS as the successor of the Mk-5A. NAVAIRDEVCEN made the design changes necessary to make the VWS more compatible in VA/VF aircraft and to correct other reported deficiencies. Patterns and sizing data were revised, based on the outfitting experience of the various APTU's.

The new model VWS – the type CWU-33/P – has the following improved design and material features:

- More flexible, thinner (1/8 of an inch) neoprene foam material to increase overall mobility and reduce bulk.
- An improved ventilation system and new technique for attaching it to the foam coverall to increase arm mobility without restricting the natural stretch capacity of the foam material.
- A removable nomex outer shell designed as an integral part of the wet suit coverall. This eliminates the necessity for donning an extra garment, simplifies anti-G and vent air hose pass-through connections and, in general, improves overall comfort and mobility.
- Rhovyl underwear garment labels stating laundering instructions and warning against washing at excessively high temperatures which cause shrinkage.
- Addition of elastic stirrup straps to the underwear to keep the legs from bunching up under the foam coverall.

Repair and Maintenance

The VWS has the advantage of improved repair and maintenance capabilities over previous antiexposure suits. Detailed information will be in the next revision to the Aviation-Crew Systems Manual, NAVAIR 13-1-6.7. Minor tears and holes can be easily and quickly repaired at the local squadron level with neoprene cement and foam sheeting patches. Most important, reliability and

cold water protection offered by the VWS are not compromised by small tears or holes or slight water leakage such as might occur as the result of ejection. The nomex flight suit worn over the VWS will provide additional protection to the suit in emergency egress. There has not been an operational ejection in the VWS to date.

A new 16mm color training film on the CWU-33/P VWS is slated to go out to APTU's and outfitting activities this fall.

The suit is a fleet-controlled item. Type commanders will govern the priorities stated in NAVAIRSYSCOM message 272113Z April 1971. Antisubmarine pilots and aircrewmen are slated to get the suit first. A contract for manufacture of the VWS has been let. The first increment of 7266 suits is scheduled for delivery this fall. A second contract for 6553 is being negotiated and it is anticipated that deliveries will begin early in 1972.

Wind Chill Chart

THIS chart shows the cooling power of wind on *exposed flesh only*. Other factors which enter into the development of frostbite are duration of exposure and adequacy of clothing protection. The "equivalent temperature" on the wind chill chart indicates approximately the temperature which, at calm wind conditions, produces the same sensation to exposed flesh as the existing temperature and wind combination.

Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)

Estimated wind speed (in mph)	Actual Thermometer reading (°F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (°F.)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
Wind speeds greater than 40 mph have little added effect.	LITTLE DANGER (for properly clothed person) Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh.			GREAT DANGER Source: NAVMED Bulletin 5052-29				
Trenchfoot and immersion foot may occur at any point on this chart.												

Here's how you use the chart: Find the estimated or actual wind speed in the left-hand column and the actual temperature in degrees F. across the top. Come across and down – the intersection is the equivalent temperature. Precautions should be taken accordingly. (The description below the columns indicates the comparative danger of frostbite to exposed flesh under these conditions.)

Give Each Task Your Best

A STUDENT pilot took off solo in a T-2B for a night familiarization flight. Everything proceeded normally until the break at homefield. As the aircraft decelerated to 165 knots, the student attempted to lower the gear but found that the gear handle would not budge. NATOPS emergency procedures were executed in an effort to get the gear down, but to no avail.

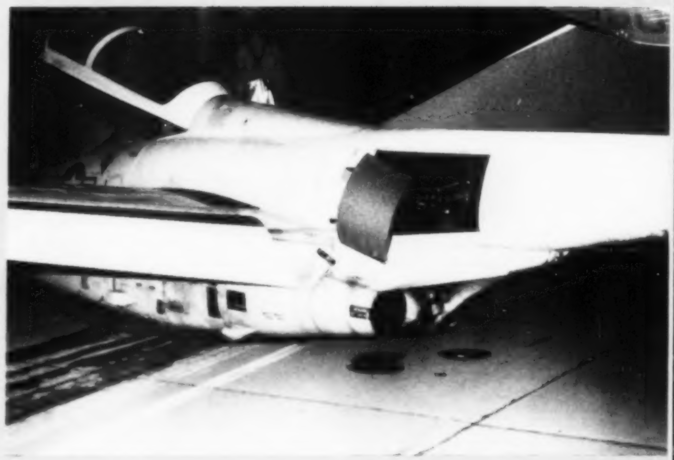
The operations duty officer ordered the student to orbit the field while the runway was foamed. A layer of foam two inches thick, 24 feet wide and 3000 feet long was laid, beginning 1000 feet from the approach end of the runway. The student was then instructed to reenter the pattern and make an intentional gear-up landing. Initial touchdown was in the foamed area. The aircraft slid 1750 feet, the last 250 feet of which was outside the foamed area. There was no fire and the student pilot was uninjured. The aircraft received substantial damage.

Subsequent investigation revealed that a bend in the forward edge of the left main landing gear fixed fairing assembly had caused the landing gear to jam in the up position. It was the opinion of the accident board members that the bend in the landing gear fairing was most probably caused by a chock being thrown into position against the wheel. Further inspection revealed similar damage to a number of other squadron aircraft. Subsequent attempts to fix personal responsibility were unsuccessful.

This accident suggests two things:

- First, aircraft can be damaged significantly if they are not treated with care. Common practices in the squadron, such as throwing chocks under wheels, throwing lox drip pans under aircraft and careless maneuvering of vehicles on the line, were also noted by the aircraft accident board. Therefore, this accident might have been prevented by better maintenance supervision.
- Secondly, the importance of a good preflight inspection was demonstrated. When questioned by the aircraft accident board, the student displayed a thorough knowledge of preflight procedures as outlined in the NATOPS Manual. However, the landing gear fairing was not specifically mentioned in NATOPS and the student overlooked the damage. Nevertheless, a better preflight of the aircraft might have brought the damage to light and raised questions as to the readiness of the aircraft for flight.

This accident illustrates the importance of performing seemingly routine tasks carefully. Whether you're a pilot, plane captain or maintenance supervisor, give each task your best.



Short Snorts

The easiest way to get into trouble is to be right at the wrong time.

Ace L.

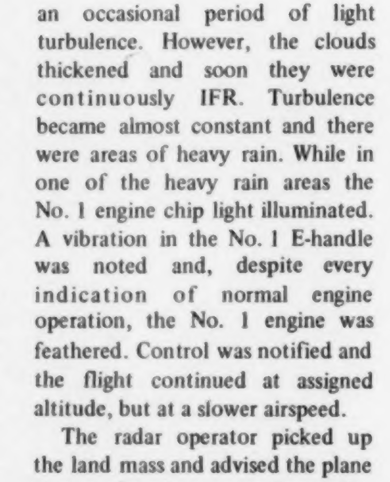
Feather One, Feather Two!

"PILOT from TACCO, turn left to 055. One and one-half miles to drop. Racks armed, stand by to drop." About 20 seconds later the big P-3 passed over the drop point and a practice bomb was released. Shortly thereafter the exercise between the submarine hunter and the quarry was terminated when a flare was released by the sub signifying a satisfactory mission ending.

The pilot added power and began a climb to altitude for return to homeplate. The crew had been airborne for about eight hours and was glad to have concluded the exercise in such good shape and to be heading back. Little did they suspect what lay in store for them.

"Ocean Control this is Navy 433. We left the operating area at 45. Present position Tuna Salad, FL 220, estimating 50 east at 37." This information was acknowledged by Control and the crew settled down for the return flight. Up front the plane commander and copilot carefully eyed the cloud buildups and one remarked that it looked like they might have a few bumps before they got home. The crew was alerted to expect turbulence and advised to take the usual precautions. At first, the aircraft flew in and out of clouds with only an occasional period of light turbulence. However, the clouds thickened and soon they were continuously IFR. Turbulence became almost constant and there were areas of heavy rain. While in one of the heavy rain areas the No. 1 engine chip light illuminated. A vibration in the No. 1 E-handle was noted and, despite every indication of normal engine operation, the No. 1 engine was feathered. Control was notified and the flight continued at assigned altitude, but at a slower airspeed.

The radar operator picked up the land mass and advised the plane commander they were sixty miles out. Suddenly the No. 2 engine propeller pump warning light illuminated. This is not good news at any time, especially with one engine already feathered. Soon they were flying on two. Both engines on the port side were out and the pilots had their hands full. An emergency was declared and Control cleared them to continue at any altitude. Fortunately there was not much traffic in their vicinity and the P-3 plane commander started a gradual descent. The worst of the weather was now behind them and the crew experienced no particular control problems. Still, night IFR flight with two engines out did not give that peace of mind which permits relaxed attention in the cockpit when everything is normal. The plane commander continued descent to 6000 feet and, as he reached the general vicinity of homeplate, was given the duty runway, surface winds, altimeter setting and cleared for an approach. Following a GCA-monitored approach the pilot landed about 3000 feet down the runway and, by judicious use of reverse thrust on his two good engines, slowed without using brakes and taxied to his line.



Investigation revealed that the No. 1 engine chip detector plugs were covered with metal flakes. The engine had to be pulled and shipped to the DOP (designated overhaul point). The No. 2 engine propeller assembly was leaking around the

pump housing seal and the packing between the rear cover retainer plate and propeller housing.

This crew paid their way. Their performance was flawless and when the chips were down (no pun intended) they were not found wanting.

A Short Happy Story

Is it a bird?
Is it a missile?
No, it's a CH-46.
Is it flying?
Is it diving?
No, it's ditching.
Will it turn over?
Will it sink?
No, it'll fly again.

The HAC, his copilot and crew chief were the occupants of a CH-46F enroute to camp late one afternoon. They were cruising at 1200 feet enjoying the magnificent scenery of the tropical islands; brilliant white sand beaches and the beautiful blue hues of the water. The ocean below was like a mill pond. Suddenly, without warning, both engines lost power. An autorotation was successfully made into the ocean. After landing, the PMS (Power Management System) was turned off and the engines restarted. The helicopter was then flown out of the water and returned to camp. ◄

THUMP . . . THUMP . . . THUMP

BEADS of sweat erupted on the Captain's forehead the minute he heard and felt a rhythmic thump . . . thump . . . thump over the drone of his jet.

He was flying at 33,000 feet and was 30 minutes out of New Orleans enroute to New York City. This was no time for something to come unglued.

The Captain and copilot made a quick check of the multitude of instruments that lined the cockpit. There were no warning lights or bells and all instruments were reading in the green.

But the thump . . . thump . . . thump persisted. The vibrations were timed at a steady 140 thumps per minute. They rechecked the instruments. They were normal.

The Captain searched his memory of dozens of years of flight training and experience for an explanation of the steady thump . . . thump . . . thump, but found no answer. He finally throttled back the engines. The thumping stopped, so he decided to continue to New York. The big jet landed without incident.

As the crew headed for the operations office, a stewardess commented: "Man, did we have a weird passenger on this flight."

"What did he do?" the Captain asked.

"Well," she explained, "this guy locked himself in the forward lavatory and then jogged in there for 20 minutes!"

Reprinted from Washington, D.C. "Daily News"

(Reprinted from TAC Attack, July - Aug 1971)

DROWNPROOFING

By Fred R. Lanoue, A
Professor of Physical Education
Georgia Institute of Technology

thru 18-21

WOULD you like to be able to remain afloat and swim for miles without depending on flotation devices, even while fully clothed? There is a deceptively simple way of combining arm and leg motions with a precise breathing technique so that anyone can do it, irrespective of sex, age, condition, strength or fear.

You have doubts? Here's proof!

Every graduate of Georgia Tech in the last 20 years, except for a few medically excused people, has stayed afloat at least one hour, and has swum one mile with clothing, using the technique I call "drownproofing."

Persons using the drownproofer technique find cramps and injuries moderately annoying, but never dangerous, because, when the method is mastered, it is just as easy to stay up with only one arm as it is with both arms and legs.

The results obtained with this system on handicapped children are fantastic. Nearly 1000 four and five-year-old children in the Atlanta area have stayed up one hour, swum one mile, then, with ankles and legs tied together, remained afloat one-half hour and then swam 100 yards. The same thing was repeated with hands tied together behind the back. All this was done with clothes on, and usually with 10 hours or less instruction.

It is a fact that about 3000 swimmers, rated as beginners, drown each year. The majority of these happen only yards from safety. It is obvious that if this technique were taught before traditional swimming methods, drowning rates could sink to an all time low.

In a short summary of drownproofing, I can tell you that it's based on several aspects of physics. The first is that 99% of all men can remain on the surface in fresh water without moving if they are chock full of air. About 99.99% of all women could do the same.

An average head weighs close to 15 pounds so, as a man floats vertically, about five pounds of weight is in the air. With women about eight pounds protrude. (These figures are general.) Fat and tidal air volume, muscle and bone density, air trapped in clothes, the wet weight of clothes themselves – all are factors. If a man wants to keep his nose and mouth out of water all the time to see where he is going, he must hold up with muscular energy at least five pounds all the time . . . and during exhalation, a lot more (with clothes on, even more). This sounds too small to be important, but over a period of time it causes most of our drownings because of the steady drain of energy.

Women and teenage girls, men and teenage boys and most children who are *good floaters* use one technique, while men and teenage boys who are *poor floaters* use a slight variation. In an emergency these basic strokes can help you bob along until you are rescued or drift ashore. To be able to propel yourself long distances without tiring, you will also need to learn the travel stroke.

When using one of the illustrated techniques, the following tips will add to your success.

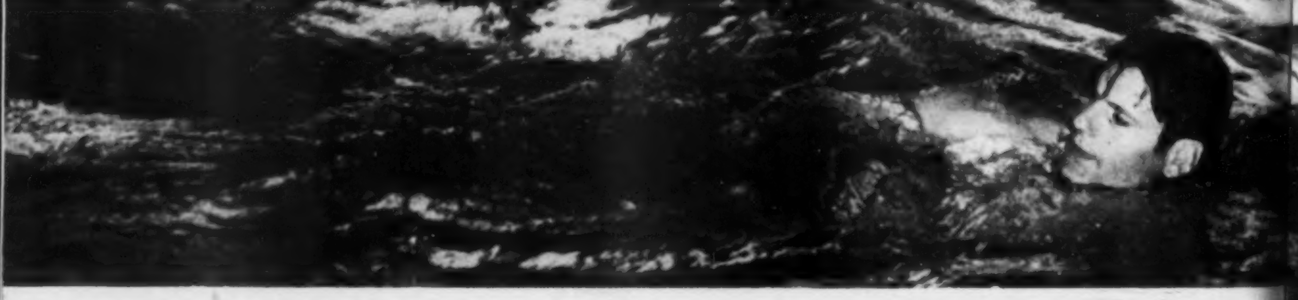
1. When exhaling, blow hard through the nose, clearing nostrils of all water to avoid choking if it trickles down throat.

2. Move arms and legs slowly. Quick, vigorous motions force body too far out of water and can be exhausting. Rest under water 5 to 10 seconds.

3. Learn arm and leg strokes separately, then together. Either, used alone, will keep you afloat. Practice with hands behind back, using legs for upward motion.

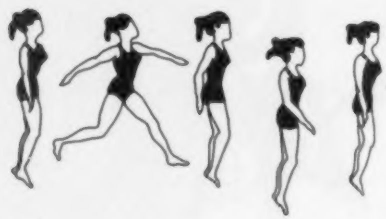
4. During first attempts, you may ship water and sputter. After 10 or 15 cycles, the technique will become easier and comfortable.

5. Ask someone to observe and criticize your technique, noting your mistakes which can be corrected. Continued



STAY-AFLOAT STROKE

for women, teenage girls, most children and many men who are good floaters



1 2 3 4 5

1. After breathing through mouth, sink under. Float relaxed, in vertical position with arms and legs dangling. Be sure head is relaxed.

2. Let yourself float to surface. The air you have inhaled will raise you naturally with no effort. When head is partly out of water, raise arms to side. At same time, stretch one leg forward and the other back as in scissors kick.

3. To thrust head above water to breathe, gently pull arms downward toward hips and bring legs together, pressing water easily with sole and heel. As arms start down (not before), begin to exhale through nose and continue until nose comes above surface. Be sure eyes are open. Then, inhale through mouth. Chin should be on surface, not above.

4. Just as head goes under again, give slight downward push with arms, legs, or both. This prevents sinking too deep. Though unnecessary in calm water, you should learn technique for less favorable conditions.

5. Rest under water, completely relaxed. Stay submerged until you desire a breath, not until you need one. At first you will probably stay under three seconds; this should be the minimum. Gradually you must increase time of rest while submerged. Average under water time is 10 seconds after doing cycle for an hour.

6. Repeat entire cycle.

TRAVEL

for all

1 2 3 4

1. Inhale to stay afloat.

2. When head sinks under, tip face down and bring hands up to forehead. Prepare for scissors kick by cocking one leg so rear foot is high as possible.

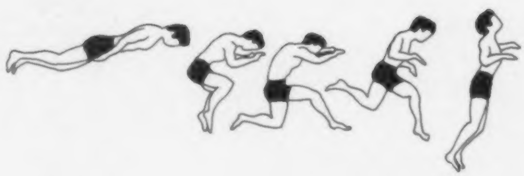
3. Extend arms forward and upward toward surface with elbows straight, hands together. As you do this, complete scissors kick.

4. When kick is completed and feet come together, bring arms backward so hands touch thighs.

5. Glide toward surface, keep head down and

EL STROKE

for all swimmers



horizontal. Body must be in a straight line. During glide, exhale slightly but never completely. How much to exhale will be learned from practice.

6. When you want a breath, begin return to vertical position by drawing both knees up near chest. Round the back and extend hands forward, up toward face.

7. Extend one leg forward for the scissors kick, without letting other knee go back. Keep arm in front of you.

8. When trunk is nearly vertical, raise head and press gently downward with sole of front foot and both hands. This will support you while taking a breath.

STAY-AFLOAT STROKE

for men and teenage boys who are poor floaters

1. Take breath, relax with arms and legs dangling, and head resting horizontally. Back of head should protrude from the water. If buttocks swing upward, you have taken too big a breath. Exhale a little air through nose.

2. As air floats to surface, cross forearms in front of forehead. Bring one knee up toward chest, then extend the foot forward. At same time, raise other foot behind and extend. Don't lift head yet, or raise arms or legs too fast. Such motion will cause head to duck under.

3. With legs extended and arms crossed, raise head quickly out of water, stopping with chin in water. As head comes up, exhale through nose and continue until head is raised.

4. The instant head becomes vertical, sweep palms outward so they nearly scratch surface. Step gently downward with both feet, bringing legs together. Strokes should not be fast or vigorous or you will rise too far out of water, and go under again quickly, giving little time for inhaling. Take a breath through mouth.

5. Relax and sink. In rough water and while wearing clothes, you will sink too far unless you drop head as soon as it is under water, and make downward stroke with arms and legs.

6. Repeat entire cycle.

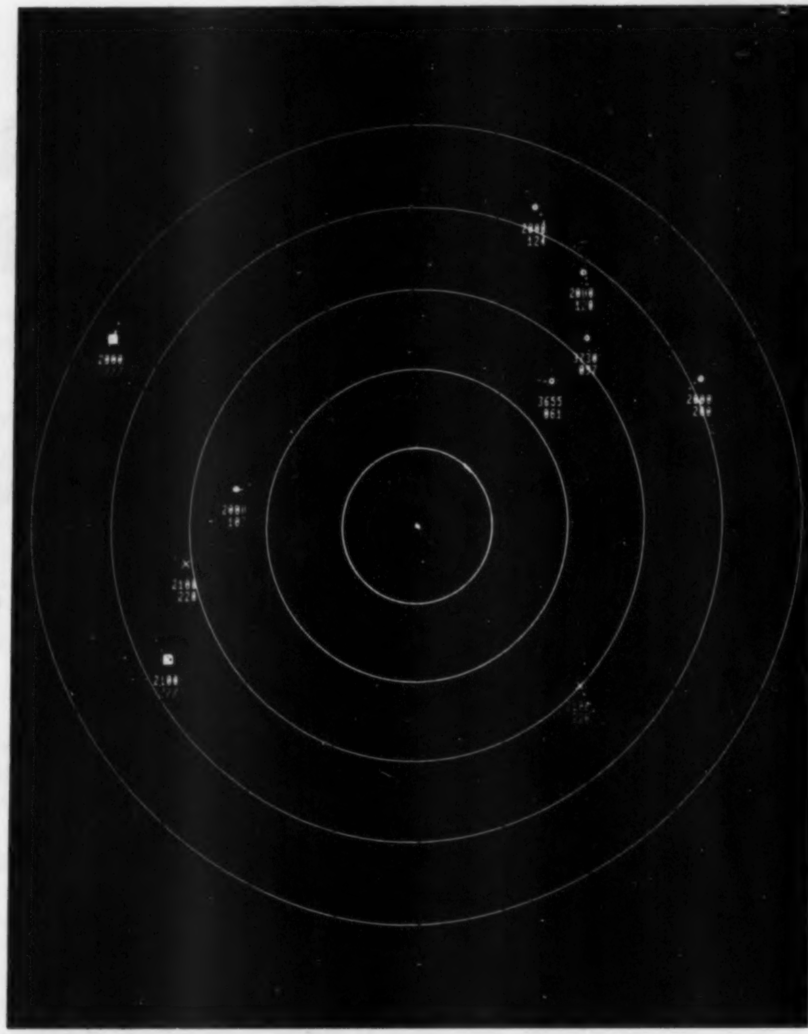
Courtesy of
TAC ATTACK July/August 1971

The DAIR System

(Direct Altitude and Identification Readout)

By Bruce Harrison
Acquisition Manager, AN/TPX-42A
Naval Electronic Systems Command

illus 22-23



A New Tool for Air Traffic Control

AFTER years of development effort, help is on the way for that disembodied voice in your earphone, the air traffic controller.

How many times has he had to ask you your altitude? Bothersome as this may be to you, the pilot, imagine the controller in that darkened control room trying to keep track of the identity, altitude, assigned heading, etc., of perhaps 10 aircraft. (No wonder the controllers are asking for disability retirement.)

As we said, help is on its way. This article will describe that imminent help and its expected impact on both the controller and the pilot.

Some years ago the Navy, Air Force and FAA began an effort to make maximum use of information to be provided by transponders under the AIMS (military air traffic radar identification system) Program. This includes the 4096 codes on ATCRBS (air traffic control radar beacon system) mode 3/A and the encoded altitude report on mode C. These two features are added to the present Mk X SIF/IFF system, one mode (3/A) has been designated for the purpose of aircraft identification for air traffic control.

As you may know, the system is based on ground equipment connected to the radar system, interrogating the aircraft with a coded question to which the transponder in the aircraft replies with a coded message dialed in by the pilot. (In the case of the new mode C, the altimeter generates the coded reply.)

Diagram shows a sampling of actual symbolic and numeric display as produced by the DAIR system. The symbols and numerics shown were derived from actual traffic in the area around Farmingdale, N.Y. (35 miles from LaGuardia and Kennedy Airports).

Significance of symbols is as follows:

x – a target selected by identity code for display on the controller's PPI

o – a target responding to interrogators with a code which does not match those selected by the controller

● – prior position (more than one scan prior to present)

Four-Digit Number – beacon code on mode 3/A

Three-Digit Number – reported altitude in hundreds of feet.

■ – targets are being filtered for display by altitude layers, and this target has been forced onto display because no altitude has been reported

∫∫∫ – replies to mode C have been received, but they consist of an invalid code.

Although the diagram shows all kinds of targets with full data, the controller may choose many variations to cut down clutter. He may show x's only, x with identity only, x with altitude only, o's only, etc.

The Navy and Air Force version of this new system is called DAIR (Direct Altitude and Identification Readout). The system provides the controller with symbolic and numeric information about every aircraft within coverage of his radar, directly superimposed on his PPI scope.

The system also provides a capability for the air traffic controller to filter this information according to his needs on the basis of identities (mode 3/A assigned codes) or altitudes (mode C) or a combination of these criteria. (For example, the controller may want only aircraft with codes 04XX and flying between 10,000 and 20,000 feet to be displayed.)

The system automatically recognizes special replies entered by the pilot on his control box, such as Emergency (7700), Communication failure (7600), Hijacked (3100) and "Ident." When a 7700, 7600 or 3100 is received, the display is forced onto all controllers' PPIs, an audible alarm sounds, and the entire format (position symbol and numerics) will blink twice a second. When the "Ident" is received, the radar target and position symbol will be surrounded by a circle which "shrinks" from large to small two times per second. These displays are guaranteed to attract the controller's attention to the problem aircraft and make the controller immediately aware of its special situation.

The system, now identified as the AN/TPX-42A, has been developed under an Air Force contract by the Airborne Instruments Laboratory, a division of Cutler-Hammer. The first delivered system will begin field testing in November 1971 at Altus AFB, Oklahoma. The Navy's first operational site is planned for NAS Oceana, Virginia, next June.

Altogether, 304 systems are on order (including 83 systems for Navy and Marine Corps use). By the end of 1975 all RAPCONs, RATCCs, mobile RAPCONs, GCAs and MATCUs will have this system installed.

This system will result in several major benefits to the Navy by:

- Providing the controller with instantaneous access to the identities and altitudes of all targets on his scope. The AN/TPX-42A will reduce the controller's workload, allowing him to concentrate on controlling traffic, rather than on obtaining information.
- Bringing immediate attention to emergency conditions, it will insure prompt action by the controller to assist the pilot to a safe landing.
- Reducing the requirements for verbal communication (altitude request, identity checks, etc.) it will reduce workload on both the controller and the pilot.

The AN/TPX-42A provides a vital improvement to the terminal air traffic control systems. Further improvements using the AN/TPX-42A have already begun which will permit terminals and enroute facilities to be connected through an automatic link. This means that, ultimately, your flight plan will one day be automatically processed anywhere in the continental United States, from takeoff to touchdown, and precoordinated with other flight plans. This will assist greatly toward insuring a smooth flight with a minimum of effort expended by pilots and controllers. Meanwhile, the AN/TPX-42A will play an important role by itself. It is here now and will prove a major contributing factor toward safety of flight in the years immediately ahead.

THEN an

PILOT — ERROR

NEGLIGENCE! CARELESSNESS!

Pilot of F4U (Bureau #13414) made a normal approach to the runway, landing with wheels up. Investigation disclosed that pilot neglected to complete the "check-off" list.

Result: Major damage to aircraft and engine.

CHECK "CHECK-OFF" LIST! SAVE A PLANE!

An F-4 Unintentional Wheels-up Landing. Cause: failure of pilot to use landing checklist properly

1944

and NOW

R

to
losed

THERE'S not much that's really new in safety education – or accident causes. Although APPROACH had not yet made its debut, there was an aviation safety publication way back in 1944. A copy of this particular pub, printed by the 9th MAW at Cherry Point, N.C., was recently inherited by the Editor. Titled simply, "Aviation Safety," it was laboriously handmade and well done. The foreword by BGEN L. G. Merrit, CG 9th MAW, says: "The following crash histories are presented in the interest of safety in Marine Aviation."

Many of the same types of accidents illustrated in the 1944 publication continue to occur today. For comparison, take a look at *then* and *now*.

1971 An F-4 Unintentional Wheels-up Landing. Cause: failure of pilot and RIO to use landing checklist properly.

"The more things change, the more they remain the same." That's what they say, but it doesn't have to be. All you have to do to prevent this particular type of accident is to USE THE CHECKLIST!

s!

4

There once was a knight 'clept José
Who was challenged to tourney one day.
The even before
He wassailed galore.
Friends ported him home from the fray.
Olde rune

THE DEMON RUM

Illus 26-28

THE SEASON approacheth when wassail and fellowship abound. At the end of a particularly grubby day, a cup of cheer can be a great unwinder – if that's what it takes to unwind you – but in the upcoming weeks when the holiday spirit steps up the social pace, let's not unwind to a fare-thee-well. Two things to remember: 1) Drink in moderation if drink you must and 2) Don't drink at all if you're flying within the upcoming 12 hours. Wait a minute – make that a triple: Even if you haven't bent your elbow in the preceding 12 hours, *don't fly if you're "hung over."*

Ever wonder just *how* that golden/amber/clear liquid does what it does to you? Well, the ingredient packing the wallop is *ethyl alcohol.* Also present are other volatile substances which slow down the rate at which your body disposes of this ethyl alcohol. Five to 10 percent of the alcohol is excreted through the lungs and kidneys and the rest oxidizes via your liver.

Alcohol acts quickly. It is absorbed into the bloodstream immediately, directly through the walls of the stomach and small intestine without requiring digestion, and transported rapidly throughout your body. An interesting thing here is that while, of course, straight liquor is quicker, different mixes vary the speed of absorption of alcohol into the bloodstream. The alcohol in liquor diluted with water is absorbed more slowly than that diluted with soda or ginger ale – it's the carbonation which makes the difference.

A fact for aviators to take seriously is that a considerable percentage of alcohol remains in the blood for a long time after drinking. Research has indicated that a significant quantity of alcohol can be present in the blood *16 hours* following a drinking bout.

You may have been operating on the theory that if you "line your stomach" before a *big party*, you'll overcome the effects more rapidly. Not so. You won't absorb the alcohol *as quickly* but the rate of elimination is identical for full *or* empty stomach. Other factors which affect your reaction to alcohol, besides the quantity and kind of food in your stomach, are how fast you drink, the type of "beverage," your body weight and your body chemistry. Your drinking reaction can also be influenced by psychological factors: situation, mood, attitude toward drinking and drinking experience.

If you don't remember anything else on the subject, please remember that *the human body requires about three hours to eliminate one ounce of alcohol.** Secret remedies, exercise, sleep or coffee notwithstanding, this rate of elimination is fairly constant. All that coffee does for you is stimulate your central nervous system, counteract the depressant effect of the booze and make you a wide-awake drunk.

Another important fact is that alcohol is a depressant, *not* a stimulant. When you drink, your pulse rate, blood pressure and depth of breathing increase and the small blood vessels in your skin dilate, giving you a subjective glow of warmth and stimulation. You may feel stimulated as all get out, but you better believe you're going the other way!

Alcohol's first effect on the brain is to slow down the area controlling judgment and thought. This fouls up your normal ability to remember, to understand and to make decisions. Critical judgment and sense of responsibility are dulled, inhibitions are released and thinking processes are impaired. You may be convinced you are the *life of the party*, suavely making time with

**USN Flight Surgeon's Manual, p. 661.*

the gorgeous creature in the scarlet hot pants, but you may be doing just the opposite. As you take on more liquor, what the medics describe as "skilled responses, sensory perception and motor control" deteriorate, interfering with your ability to coordinate arm and leg movements, speak clearly and balance yourself. Your vision becomes impaired as do your memory, judgment and reasoning. Finally, if you drink enough, you pass out (hopefully on the nearest sofa and not the deck), leaving the gorgeous creature to more interesting pursuits. *(In other words, you drink yourself right through it. – Ed.)*

What about the next morning? Hangover can be a serious hazard to a pilot flying after a drinking bout. Although you may look all right on the outside, you can still be pickled on the inside . . . under the influence . . . the proverbial accident looking for a place to happen. As one medic put it, "performance impairment is still considerable in this period and the possibilities of errors in flight are tremendous."

Particularly important for aviators is the fact that alcohol depresses cell oxidation and the tissue cells cannot use oxygen efficiently. This is why the effects of alcohol are more pronounced at altitude than at sea level. You've perhaps seen an occasional "high" passenger who prolonged his happy hour at 30,000 feet in a commercial aircraft. For any given altitude, the physiological altitude is much higher when there is alcohol in the blood.

In summary, there are three important points concerning alcohol and flying which we'd like you to take away with you:

- An amount of alcohol which produces no effect at sea level can cause disastrous impairment of judgment and coordination at 10,000 feet.
- The rate of elimination of alcohol is fixed and cannot be influenced by any specific actions of the person involved. *Three hours are required to clear one ounce of alcohol.*
- There should be absolutely no alcohol in the blood when a person flies. Normally, no crewman shall assume aircrew duties within 12 hours of last consuming alcohol, says General NATOPS.

As for those holiday parties coming up, remember that genial hosts in their own homes often mix stronger drinks than do professional bartenders. If you're on the flight schedule, act accordingly.

(Here again, commanding officers have the initiative. They usually know who consumed the most the night before and how late he consumed it. A "suggestion" by the Skipper that a pilot not fly that early morning go just might mean one less AAR. I hate to sound redundant, but the CO stands to lose also. – Ed.)

HA

QUESTION: There have been volumes written about the effects of alcohol and a person's performance while he is under its influence. But we haven't heard too much about the effects of a hangover when a person isn't actually under the influence of alcohol, but is still *affected* by the *effects* of the alcohol he drank the night before. Can you tell us, in laymen's terms, why a hangover makes the victim feel so bad the morning after?

ANSWER: In order to discuss the morning after, we must first go back and discuss the night before – that is, the effect of the alcohol in our systems. Many people think that alcohol is a stimulant. Sometimes when people get to a party, they are a bit dull or unhappy or they are normally reserved. They have a couple of drinks and soon start "swingin'" and living it up. It appears that alcohol is working as a stimulant. Alcohol is not a stimulant; actually it is a central nervous system depressant. It removes their inhibitions and may lessen their worries as it depresses their judgment and abilities to function with fine coordination. Chemically, alcohol degrades the blood's ability to carry oxygen to the brain and other cells. Now let's talk about the symptoms of a hangover and why they occur. A healthy liver will detoxify alcohol at the rate of

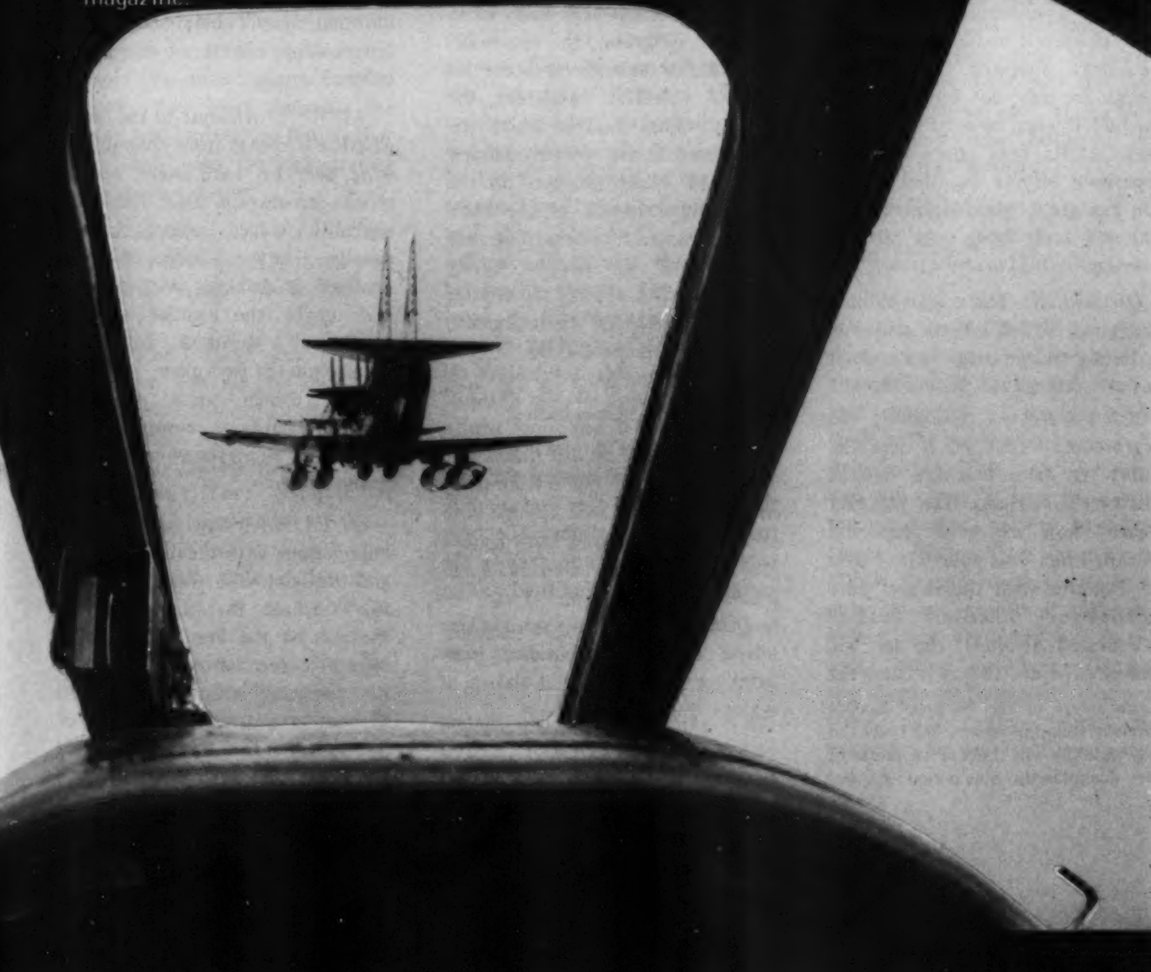
Added

ANGOVER

HAVE you ever flown with a "terminal" hangover? No? Neither have we, but there are stories bruited about in this world about folks who have and who have pledged to the Almighty, in exchange for "just this one safe flight," all kinds of long range and basically unkeepable promises.

"Just you and me, Lord. Get me through this flight and I'll never touch another drop of the stuff — ever."

Although the hangover is not listed as a major operational problem area in flying safety, we have often wondered what all the moaning was about the next morning and why last night's "life of the party" looks like seven miles of bad road today. The following interview on the subject was conducted with *Col. Lawrence J. Enders, USAF, Chief of Aerospace Medicine, Air Defense Command.* It is reprinted with permission of *INTERCEPTOR* magazine.



No two people react exactly the same to alcohol. Even your individual temperament and the mood you're in can affect the results of drinking to some degree. But in general, the above chart describes six stages a drinker reaches as blood-alcohol increases. * The 0.05 to 0.10 range is critical. Somewhere in that range you've had too much to perform any activity that requires any degree of coordination or judgment. In particular, you're too intoxicated to drive.

National Safety Council

about one ounce an hour.* That means simply that for every unit of alcohol a person drinks, he'll have to wait one hour before he is completely free of its effects. So even if he gets a pretty good night's sleep after hitting a party fairly heavily the night before, he may still have a substantial amount of toxic chemicals in his bloodstream the next morning. And, even though he may not feel anything like he felt when he went to bed, he may still feel the alcohol's depressant effects. In other words, you can get a "good night's sleep" and still feel "hung over" in the morning.

QUESTION: There is an old line that goes, "I don't know why I'm so thirsty today; I sure had enough to drink last night." Why is this so?

ANSWER: Alcohol is hygroscopic. That is, it has the ability to take moisture out of whatever it contacts. Have you ever noticed how ice in a glass will crackle when you pour liquor over it? Try this with the almost pure laboratory alcohol (called dehydrated alcohol); the ice will almost explode. This is because the alcohol is so hygroscopic that it is trying to absorb the water out of the ice and the ice isn't melting fast enough. This same dehydration happens to a person. The alcohol he drinks absorbs a lot of his normal body fluid. This is why his mouth feels dry even though he's had lots of fluid to drink. This leads us to the next symptom, the headache. Alcohol also takes the moisture out of, and therefore condenses, the cerebral spinal fluid in which the brain floats in the cranium. Loss of this fluid causes tension on the supporting structure of the brain and that causes it to ache. You may have heard of people having headaches after a spinal tap or after a spinal anesthesia. These are also due to a loss of spinal fluid.

QUESTION: What is the best way to cure these headaches?

ANSWER: Of course aspirin or any analgesic will deaden the pain that you feel, but here you are only treating the symptoms. The only way to "cure" it is to remove the cause – to replace that fluid.

QUESTION: Then would you advise a person who had been drinking to have several glasses of water before going to sleep?

ANSWER: Yes, fluid replacement is the answer. But remember that your system can only absorb so much moisture, and it may take quite some time to completely reverse the dehydration.

QUESTION: Is there any truth to the old story that if you drink champagne or wine the night before and then drink water the next morning, you'll reexperience the intoxicating effects of the night before?

ANSWER: Alcohol is the same whether it comes from champagne, wine, beer, or "hard likker" and its effects are also the same. This story probably evolved because there is usually a larger volume of liquid involved in drinking wine or beer and maybe the alcohol was not really all absorbed from the stomach in the first place. When the subject drinks some water, it further facilitates absorption by expanding whatever volume is left in the stomach.

QUESTION: Say a guy hit happy hour with great exuberance and really tossed them down for the first hour, then tapered off for the rest of the evening. Could he expect to feel better or worse the next morning than the guy who drank the same number of drinks, but spread them over a long period of time?

* This refers to the 86 proof alcohol normally found in liquor. The body can only detoxify one-third of an ounce of pure alcohol in this time period.

ANSWER: The "way" a person drinks by itself has no bearing on how he'll feel the next morning. It's the amount he drinks and when he quits that is important. As we said, a healthy liver will detoxify about one ounce of booze each hour, no matter how much there is in the system. It begins detoxifying as soon as alcohol enters the system. While we're on the subject of the liver, let me make two points. First, the liver must have carbohydrates in order to function properly and keep healthy. That is why you may be better off if you eat nourishing food before, while, or even after you've been drinking. Secondly, if a person has been a heavy drinker for a long time, he can't expect his liver to detoxify anything at the same rate as the normal liver.

QUESTION: Is there anything a person can do to speed the recovery from a hangover?

ANSWER: No. Time is the only therapy to correct the physiological changes you must undergo to fully recover. You must detoxify the alcohol and replace the liquids that were "lost" by the dehydrating effects of the alcohol.

QUESTION: But is there anything you can do to make you feel better while you're getting better?

ANSWER: There are several things we can do to ease the symptoms as our system detoxifies the alcohol. We can ease the headache by taking aspirin or other pain killers. Your stomach is probably uneasy and a bit raw from the alcohol. You can ease that somewhat with antacid. Another good thing to do when you're feeling poorly is to eat a good breakfast. This may be the last thing you really feel like doing, but you will be putting something in your uneasy stomach and you will also be providing non-alcoholic carbohydrates for the liver. The coffee you drink with breakfast is good because it not only replaces dehydrated liquids, but acts as a stimulant to counteract the depressant effects of the residual alcohol. Even a cold shower will make you feel better, but let me repeat that many of these things treat only symptoms and not necessarily the physiological changes. One other word – on the myth of breathing 100 percent oxygen. There is absolutely nothing to indicate that 100 percent oxygen can help. It *may* make you feel better, but I think that is 99 and 99/100 percent psychological. If you *think* it is going to make you feel better, it *may* make you feel better.

QUESTION: If a guy has a hangover, then he really shouldn't expect to be up to par in his performance.

ANSWER: That is true; but this could be for several different reasons. First, he may still be under the depressive influence of the residual alcohol his system hasn't had time to detoxify. In this case, if he has an accident and the medics take a blood sample from him, it will show him to be under the influence of alcohol. He may even be legally drunk. On the other hand, he may have had sufficient time to detoxify all the alcohol in his system and still feel lousy. His stomach may be upset and his head aching from the dehydration. The distraction caused by this pain and discomfort, until his symptoms have ceased, could be more serious than a little residual alcohol. If he can't concentrate fully on his job, he may be more likely to make a mistake or error of omission, and have an accident.

QUESTION: It is generally known that altitude has an effect on one's reactions to alcohol due to the reduced oxygen pressure – that

ANSWER: No, not on the ability to detoxify. The liver will continue functioning at the same rate – you're just going to feel a little worse because of the combined effects of the relative hypoxia from the altitude and the depression from the alcohol. It can increase the magnitude of your symptoms. If you have a headache, you may have a worse headache – but the liver will keep on working at the same speed.

QUESTION: How about tolerance to "G"?

ANSWER: Since generally the whole body's functioning is degraded by alcohol, including muscle tone, a person will feel sluggish and his tolerance to "G" will decrease. He may not realize this degradation until he pitches out with his usual pull and finds himself "graying out" at 3G when it wouldn't have bothered him when he was "healthy."

QUESTION: Do you have any advice to give the potential partygoer/pilot (in that order)?

ANSWER: Yes, I would advise that if he has to fly the day after a party he (1) give himself plenty of time following the last drink to rest and detoxify. (2) Replace fluids (not with booze) to correct the dehydration. This will take effort and will normally have to be done the next day. (3) Try to relieve those distracting symptoms (headache and nausea) with food, antacids and aspirin, if necessary, before you fly. And, of course, don't take off until you are back in top shape. (4) Remember that only time can really "cure" the hangover. So pray that time passes quickly.

safety *(n.)* 1. Condition or state of being safe; freedom from danger. 2. Hence, quality of making safe or of giving confidence, insuring against harm, loss, etc.

What is SAFETY?

By Ken Book
Production Technical Foreman,
Firestone Synthetic Rubber
& Latex Company,
Orange, Texas

WHAT does "safety" mean? Is it freedom from danger, injury or damage? . . . security from harm?

Yes, but more . . . much more.

Safety can be demonstrated in the ways we accomplish various things. It can be talked about. If we have it or practice it, we can feel the results of it. If we don't have it or practice it, unfortunately we can readily feel the results of this also.

Industrial safety engineers, managers, supervisors and foremen, insurance companies and workmen all believe in it and want it. But what is it? And what is its price?

It's really quite simple. It's a way of life and it's cheap in price, compared to the dividends it pays. When I say it's a way of life, I mean it's not something that you should have to stop and think about before starting a job. It should be as familiar to you as breathing. It should be a built-in part of every living moment.

Strangely enough, most of us make it part of our existence most of the time, like unconsciously looking in both directions before crossing a heavy traffic thoroughfare, or other routine aspects of living. But to accomplish this feeling of security, this freedom from pain, freedom from anxiety when a loved one is hurt, we have to pay the price. And, as I said before, it's cheap.

It's what we have heard for years . . . *Practice Safety*! This means that until we have incorporated safety into every move we make in our life we need to think – think – think!

If you start to sharpen a pencil, think, "I don't want to get hurt." If you show your son how to load a gun, *think*, "We don't want to get hurt."

In any and everything you do, force yourself to *think* how you will do it so that neither you nor anyone else suffers physical pain from the act.

Consider the hazardous occupations and the hazardous sports . . . when we laymen see some of these sports on television, we are in awe at the danger that, we feel, must be present . . . and present it is!

But you can bet your life that these people aren't novices. You don't take a man and put him behind the wheel of a hot race car that will do close to 200 mph and expect him to survive the "Indy" 500 without years of *practice*. And you can be assured safety was an integral part of his learning process to put him across that finish line safely.

But once he has learned to drive that car, he doesn't consciously think of the safe way or the unsafe way to drive in a race. That's passed. It has become a part of his very existence while on that track.

To perform our various jobs as safely, this is what we have to do – train and train . . . be thorough . . . make sure we understand the safety angles of each job. Learn it well – and then safe operation will become a part of us.

This is the gut part of safety. It takes work to do it – but you and your family and co-workers will reap the benefits if you make safety an integral part of everything you do.

Life Preserver Buoyancy

A SQUADRON survival officer recently asked the Safety Center the following questions (which he said were often asked him):

- How much weight will a Mk-3C life preserver and an LPA-1 lifevest support *above* water? (I know the buoyancy is 60 and 65 pounds respectively.) *The Mk-3C will support 60 pounds deadweight and the LPA-1, 65 pounds deadweight. There is no cut and dried answer to how much weight either will support above water because so many buoyancy factors are involved. Other than tests with deadweights, the variables involved such as body structure, water displacement, etc., make positive statements as to how much above water support is offered near impossible.*
- Will a man who weighs 250 pounds with his survival gear on be supported? *Yes, he will, by either the Mk-3C or the LPA-1.*
- What if only one of his CO_2 cartridges operates properly? *He can have problems, depending on how much survival gear he has on and where it is located. Oral inflation is some help here. With only one cartridge actuated, the survivor is lower in the water. If he should flip upside down, he's in trouble. However, properly worn, the LPA-1 should prevent the survivor from flipping upside down.*
- Will either survival device keep a man afloat if now he has the additional problem of a sinking chute still attached to him? *No – only for a very short while at best. The primary thing in such a situation is to get rid of the chute as expeditiously as possible.*

We would suggest that any pilot unduly concerned over how much of his anatomy will be above water in a survival situation – make a test. Weight yourself down equal to what you weigh in the cockpit, using a "mock-up" survival vest and other paraphernalia, which your local rigger will gladly supply – then jump in the swimming pool. Or better yet, try it at the beach where choppy (buoyant salty) water will give a more realistic appraisal.

Helmet Takes Brunt

PRIOR to launching aircraft, no-loads were being fired on the catapults. An ABE3 deviated from his normal routine by standing on the port catapult track because a helo was spotted to the left of its normal spot on the centerline. When the Van Zelm operator retracted the bridle, it swept the ABE3 off his feet. He landed on his head. Although he was dazed by the fall, his flight deck protective helmet took the brunt of the impact and he was uninjured.

Investigators cited a combination of cause factors for this mishap: 1) Van Zelm operator error in retracting the bridle without ensuring that the catapult track was clear; 2) Personnel error in standing on the track while no-load launch procedure was in progress; and 3) Helo spotted too close to the catapult track.

"Catapult operators have again been reminded to check the catapult tracks prior to initiating retract," the investigating ship's safety officer stated. "All catapult crewmembers have been reinstructed concerning safe areas.

notes from your flight surgeon

This near accident vividly proves the value of the flight deck protective helmet."

Loose Chinstrap Dangerous

AN A-7 pilot's helmet chinstrap was fastened loosely. When he ejected during night carquals, his helmet rotated over his face. In this instance, helmet rotation was merely an annoyance. However, as the investigating flight surgeon pointed out, a loose chinstrap *can* cause loss of the helmet during ejection with tragic results. A helmet with a loose chinstrap can rotate backwards on ejection and strike the spine at the nape of the neck with enough force to inflict spinal injuries. It is for this reason that the APH-6 helmet has an extra cushion on its back edge. The best thing to do is to prevent helmet rotation in the first place *by wearing your helmet chinstrap snug.*

Prop Injury

THE habit of walking through propeller arcs of parked aircraft and lack of dark adaptation were factors in a fatal prop accident along with the possible factor of fatigue.

An ABH3 aboard a carrier reported to flight deck control at 1800, but because of the uncertainty of the time for the next launch, he went to a coffee locker and watched TV until the launch was almost ready to go. Then, along with two other men, he proceeded from the brightly lit coffee locker to the flight deck. He went under the tail of an E-2B, climbed over a light trap, and then proceeded to walk between the port engine nacelle and fuselage of the aircraft. He stepped over the starting hose connected to the port engine and walked directly into the aircraft's turning propeller.

Although the ABH3 had defective visual acuity, he was wearing his glasses when the accident happened. The only illumination was red lighting from the superstructure. He was not on the flight deck long enough to attain adequate dark adaptation before the accident occurred, the investigating flight surgeon stated. In addition, the noise of the huffer on the starboard side of the aircraft kept him from hearing anything to warn him of impending danger.

Fatigue may have played a role in this particular accident, the flight surgeon states. The ship had been going through a "grueling" exercise for several days. Although flight deck personnel were working 12 hours on and 12 hours off, noise from flight operations was continuous. Under such conditions, as everyone knows, quality of sleep can be affected.

Interviews with flight deck personnel disclosed that the habit of casually walking through static propeller arcs of parked aircraft is widespread. No one should walk through prop arcs under any circumstances. Habitually observing this precaution under all circumstances will minimize the likelihood of a person inadvertently walking through the arc of a turning prop.

The flight surgeon also called for more emphasis on night vision training for flight deck personnel, especially the importance of dark adaptation.

Prepared

THE ability of the pilots and crewman to survive this aircraft ditching at sea is attributed in large part to their emergency and survival training and the condition of their survival equipment.


51
NAVY

'I've Got Trouble'

(airplane icing).

illu 36-38

WINTER weather is once again approaching. This means an increasing number of flights will be either penetrating or operating within the freezing level. Icing, therefore, becomes a potential inflight problem of great magnitude when the right set of atmospheric conditions prevail. While we will not attempt to review those conditions which *cause* icing, we will recount some of the details of an aircraft accident which is believed to have occurred as a *result* of icing. This case involved a T-2A aircraft but the lessons learned apply to all types of aircraft, particularly those not having deicing equipment.

In this case, an experienced instructor pilot and a student pilot manned the aircraft for a special check flight as part of the instrument training syllabus. The observed weather at this time was 900 feet scattered, measured 1200 feet overcast, three miles visibility and very light ice pellets (rime ice) in fog. The top of the overcast was undetermined.

Poststart checks were normal and the student later recalled that the only discrepancy noted prior to taxi was that both altimeters read approximately 100 feet high. The instructor taxied the aircraft while the student completed the instrument checklist. During taxi, the instructor inquired about the student's airspeed indicator. The student's indicator read zero, but the instructor's indicator was showing some undetermined airspeed. The instructor remarked that he would turn the pitot heat on to melt the ice or water in the pitot-static system, and before takeoff mentioned that the pitot heat must have worked since his airspeed indicated zero. (Note: As the aircraft accident board later noted, turning the pitot-static heat on during ground operation normally has no effect as the heater will not work until weight is removed from the landing gear struts.)

The aircraft taxied into position and the engine checked good with an acceleration time of 11 seconds. Both the pitot heat and canopy defrost were on.

The instructor made a normal takeoff, and shortly after takeoff (with gear and flaps still down) passed control of the aircraft to the student pilot. At the time, defrost air was causing the side panels of the instrument hood to flap back and forth and distract the student. This, combined with the transition from contact to instrument flight caused the rear seat pilot's performance to deteriorate to the point that the instructor had to assume control of the aircraft again. However, when they leveled at 2000 feet the student was again given control of the aircraft. He then completed the climb to on top (tops were about 7000 feet) and leveled off at FL 230. Just prior to leveling, both pilots heard a loud "clunk." The instructor

remarked that the noise was probably caused by loss of a chunk of ice accumulated during climbout. A check of the engine instruments in both cockpits revealed nothing out of the ordinary.

Thereafter, the flight at altitude consisted of a series of basic instrument maneuvers, e.g. S-patterns. At the completion of the basic instrument work, the instructor assumed control and commenced a descent to arrive at Nearhome intersection for a GCA pickup.

Ten miles northeast of Nearhome intersection initial contact was made with approach control and the T-2A pilots were advised to report Nearhome intersection. Radar contact was confirmed at the intersection and altitude verified to be 9000 feet. To avoid icing, the instructor requested clearance to remain high but was cleared to descend to 5000 feet and given a change of frequency. A level report was made at 5000 feet with an accompanying request for a lower altitude. At this time the student lifted the instrument hood and noted an accumulation of ice on the wings.

Approach control "Rogered" the request for lower altitude but did not grant clearance. About 30 seconds later the instructor made a second request for a lower altitude and remarked that he was encountering ice. The controller "Rogered" the request and issued a frequency change. In his first transmission on the new frequency, the instructor again requested a lower altitude due to rime icing. Clearance was given to descend to 2000 feet and to perform the cockpit landing checklist. The instructor reported leaving 5000 feet for 2000 feet and, when level at 2000 feet, 160 kias, heading 170 degrees, returned control of the aircraft to the student.

The rear seat pilot transitioned to the basic approach configuration of gear down, one-half flaps and 130 kias. This particular maneuver had always proved difficult for the student so he made a special effort to make a smooth transition. He lowered the gear handle and then lowered the flaps to the one-half position. Apparently he did not move the gear handle downward far enough. The instructor noted this and remarked that the next time the student should ensure that the gear handle was down.

In effecting the landing configuration transition, the student had gained about 400 feet. The instructor, noting this, took control of the aircraft and remarked that the flight would be incompleted because of ice buildup, and the fact that the weather precluded completing all the required instrument patterns. The student was anxious about his performance during the hop and was relieved when the instructor stated that the hop would be incompleted.

The approach controller issued missed approach procedures and the instructor acknowledged. To facilitate traffic spacing the aircraft was vectored through the final approach course. The aircraft was then directed to turn right to 320 degrees and 35 seconds later directed to continue the turn to 350 degrees. Fifty seconds later the aircraft was vectored left to 290 degrees. Forty-five seconds into the turn the aircraft was turned over to the final controller. Initial contact between the instructor and the final controller confirmed satisfactory communications. The final controller then requested a wheels report but received no reply to this or subsequent transmissions. Shortly thereafter it was determined that the aircraft had crashed. Both the instructor and student pilot ejected prior to the crash, but the instructor's ejection apparently took place outside the safe ejection envelope since he was fatally injured. The student escaped without injury.

The pilot-under-instruction later recalled that, shortly before the ejection, the aircraft entered a pronounced buffet and then stabilized momentarily. The instructor made an exclamation to the effect that, "I've got trouble." At the first buffet, the student reached up to unsnap the instrument hood but had removed only two snaps when he heard the instructor's exclamation. He reached for the face curtain but his hands became entangled in the instrument hood. The aircraft then departed controlled flight and entered a clockwise rotation. Before he could make a second attempt for the curtain, the student heard a loud bang (the ejection seat firing) and found himself free of the aircraft.

The aircraft accident board concluded that the aircraft had stalled as a result of an accumulation of ice which raised the stall speed well above normal. Loss of thrust and loss of control response were considered, but discounted as possible cause factors.

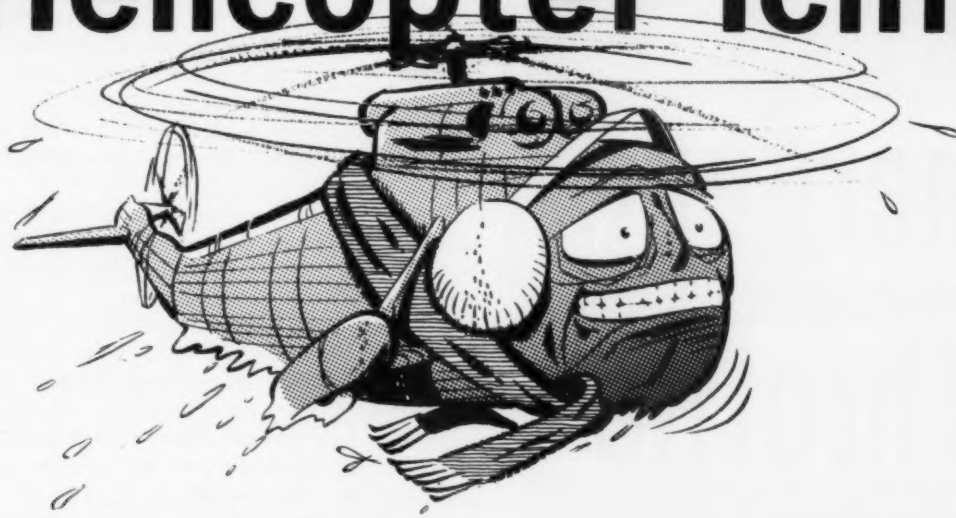
An endorser to the AAR stated:

"The tragic loss of this experienced aviator and outstanding instrument pilot, who was well briefed and fully cognizant of existing weather conditions, serves to point out the insidious effects of icing conditions."

This statement contains a thought which should be taken to heart by every naval aviator: *icing conditions are extremely hazardous.* Furthermore, icing is insidious in that it can deform the shape of the wing to the point where customary airframe stall warnings are absent.

With winter weather almost upon us, it is appropriate for every naval aviator to take the time to review both winter weather hazards and the performance characteristics of the aircraft he flies. Don't be caught unprepared – do it now! *(Safety officers – it's time for those winter weather lectures during APMs. – Ed.)*

Helicopter Icing



PROGRESS has been touted as the most important product of a certain large corporation. In the field of aviation, most contractors like to think they are as progressive as any other in the industry. However, it just happens that the state-of-the-art does not lend itself to the simple solution of some things – like anti-icing and deicing equipment for helicopters. The time has not yet arrived when helicopters can be considered truly all-weather. So, when pilots fly aircraft with limited capabilities, caution is advised.

Every winter there are many examples of helicopter pilots who take on a load of ice and end up making forced landings or precautionary landings when it turns out, just as NATOPS says, that the helicopter doesn't operate well under these conditions.

Two pilots of an H-3 found out the hard way that an iced-up helicopter gets kind of sickly, real quick. The pilots filed from NAS Cranberrybog to NAS Fleetsville. The weather at "Bog" was 1500 overcast, 5 miles in haze, temperature 39°F, winds reported as light and variable. Forecast weather for destination was 1000 broken, 300 overcast and 7 miles visibility. Enroute, the aerologist had forecast rainshowers and snowshowers, icing in clouds and a freezing level at 5000 feet. Initially, their IFR clearance called for an assigned altitude of 4000 feet. *Fine!* However, during their climb, Big City Center amended this to 6000 feet. *Oh, oh!* They accepted the higher altitude without demurring and settled down, but not completely relaxed, for the two-hour flight. Despite flying in and out of showers for an hour and a half, with temperatures ideal for icing, the helicopter droned on with those two big turbines singing sweetly. As they tooled along the airway, over the shoreline of Big Bay on the last leg, they requested a descent to lower altitude. Their request was granted. While descending, OAT +2°C, the helo encountered heavy precipitation of mixed snow and rain. Slush was noted on the windshield but there was no visible ice on the wipers or sponsons (the usual places). In spite of this, what they expected to happen *did* happen. A compressor stall occurred in No. 1 engine with a noticeable torque split! Light compressor stalls continued until No. 1 was shut down. The two pilots lucked out, however, because No. 2 engine kept operating normally, and they made it across Big Bay without having to ditch.

Why did No. 1 engine act up? Investigation revealed IGVs (inlet guide vanes), first stage stator and first and second stage compressor blades – all damaged due to ice ingestion.

The pilots of the next helicopter involved in this type of situation may not be so fortunate. It stands to reason when pilots defy the General NATOPS Instruction and the model NATOPS Flight Manual that they are, sooner or later, going to have their hands full, just for openers, but some are going to be even less lucky. *Gents, believe that WARNING in the NATOPS Flight Manual concerning icing conditions.* When a machine has capability limitations due to inadequate or totally nonexistent safety devices, don't push yourself *or* the machine over the brink. You can't say enough for good 'ole fashioned *common sense*. ◄

Emergency Throttle

By LCDR D. A. Mohr, USN

EMERGENCY throttle? Even the name is enough to conjure up unnecessary adrenalin and some doubts. In fact, some helicopter models seem to fare far better with semantics by simply calling it a manual throttle. A manual throttle, many contend, does not require an actual emergency to practice for proficiency. Let's hope you don't wait for a bona fide emergency to commence your emergency throttle checkout. That might be too late!

Call it what you and your own NATOPS may, all helicopter emergency throttle systems do the very same thing, that is, override the automatic features of the fuel control. Through twist grips, choke cables and beep trims, the resultant action should be similar. Of course, in selecting manual throttle, the pilot sacrifices overspeed and overtemperature protection on that engine and must monitor these parameters himself. Before this fact causes you any degree of concern, let's remember that these very same potentially dangerous capabilities once existed in every reciprocating engine helicopter, but pilots didn't worry needlessly about them.

Some confusion appears to exist in the CH-46 ETS (emergency throttle system) and engine overspeed interface. General Electric T58-10 engines have two advertised overspeed protection systems. As the first limit is reached (at 113 to 117 percent N_f) an electrical signal will cause P_3 pressure to dump and thereby reduce fuel flow, thus causing an engine cycling condition. The latest change to the CH-46D/F NATOPS alerts pilots that this feature is not available whenever the collective pitch is above one-third travel or when operating on the emergency throttle system.

The other mechanical overspeed exists within the fuel control itself and functions between 115 to 119 percent N_f. This is the only overspeed protection available on the T58-8 and -8F engines installed on the CH-46A model. This system will interrupt fuel flow through a valve action and flame out the engine to prevent a destructive overspeed. But the point is that if you are flying on the ETS and allow a rotor excursion into this range, due to a lowered collective pitch (such as an approach for a landing), you will lose that engine! Although rare, even a relight would be of little help, considering you are dumping maximum fuel into a rapidly decelerating engine. This condition could result in a maximum T_5 temperature for a very brief duration.

It would follow that attempting to control an engine with a failed flex shaft could be very dangerous on any CH-46 helicopter. In this situation *no* overspeed protection exists on that engine!

The most valuable tool the pilot has for ETS control is the collective pitch. It can be raised to load the rotor system to control a potential overspeed or lowered to maintain required RPM. Ironically, this same flight control can be traced as the source of nearly all ETS incidents, AARs and innumerable unmentioned grey hairs; for once a rate of fuel is established through the ETS, unloading the rotor (through lowered collective) can only bring about a near overspeed condition. Therefore, any lowering of the collective *must* be coordinated by a reduction in emergency fuel flow. A demand for power will require an increase in fuel flow or RPM deterioration will result. This should sound familiar to former H-34 pilots.

To effect a changeover from automatic to ETS, more fuel must be supplied via the emergency fuel control than is presently being demanded. In an actual emergency, especially in the single-engine UH-2A/B, the sticky point used to be how fast the changeover could be accomplished. Many pilots found that it could be done from 500 feet in autorotation. The time delay or dead-band you encounter is predicated upon the level of power being demanded at the time of the failure. The tendency to rush the changeover, by proper intermittent beep trim inputs at first and then resorting to steady

trim as the situation deteriorates, is lethal. This can produce maximum power just when you'd rather not have all that much – for example, in autorotation with an unloaded rotor system. A similar condition could exist in a dual-engine configuration if the pilot attempts to accelerate a failed engine very rapidly with maximum beep trim. In this case a compressor stall could result.

How can we determine *just when* we have supplied enough fuel flow to effect a changeover? While many IPs recommend monitoring the torque indicators for an increase, N_g is actually better! Although torque will give more response in indicator needle displacement, in an actual emergency, if it were necessary to enter autorotation or a low-power condition to maintain rotor RPM, torque would be a poor choice – in this situation it would be indicating zero! A UH-2C pilot found he could monitor torque all the way to the ground in autorotation, while constantly trimming up the ETS, and see no change. You can bet he had plenty of power coming out of that autorotation!

The ETS arming circuit should not be overlooked as a quick check of a PMS (power management system) problem – especially if you happen to be caught at an inopportune time and an engine "drops off" the line. Quicker than telling the copilot to secure PMS in a high-pitched voice is to simply arm the circuit with the thumb switch. If both engines respond normally, you know your PMS is acting up. You can then secure PMS and reset the ETS at your leisure. If not, you have maximum power available to meet any contingency. As a point of interest, arming the ETS provides the exact same function as securing the PMS switch. No more power is available unless the beep trims are increased, providing emergency fuel flow.

Few pilots feel there is anything to gain by flying both engines on ETS. The odds against this type of failure are just too great. Therefore, a more realistic approach is to control a failed engine through use of the ETS. When practicing, resetting one engine will give PMS and usual droop anticipation on that engine in an H-46D/F model. Then trim the "failed" engine to within 10 to 15 percent Q of the governed engine and maintain this split at all times. In this way the ETS engine will always be held in reserve, and the governed engine will have the same responsiveness as normal. Closer torque matching can be achieved but it will require more pilot attention and effort.

So start your ETS checkout early and before that "moment of truth." A good place to begin is in level flight with ALT HOLD off. Don't experiment in the chocks where you sacrifice use of the collective pitch. Approaches to a hover should be handled cautiously after your technique improves. Don't sweat small RPM excursions but try to lead all collective pitch movements with proper beep trim. By all means take your time and don't rush. ◄

Anymouse

Chock Jumper

A LINEMAN from an A-4 squadron was acting as taxi director for aircraft moving into the refueling pits for hot refueling. Since it was a *very* hot day and there were a large number of *Skyhawks* returning to the pits at one time, he directed this particular A-4 into the vicinity of the fuel pit to another lineman who would chock the aircraft and have it shut down.

The purpose of Anymouse (anonymous) Reports is to help prevent or overcome dangerous situations. They are submitted by Naval and Marine Corps aviation personnel who have had hazardous or unsafe aviation experiences. These reports need not be signed. Self-mailing forms for writing Anymouse Reports are available in readyrooms and line shacks. All reports are considered for appropriate action.

REPORT AN INCIDENT,
PREVENT AN ACCIDENT

After the taxi director turned the aircraft over to the other lineman he turned his back and commenced directing the next aircraft approaching the fuel pit area. The A-4 involved was chocked at the nose gear by the second lineman and the pilot secured the engine and debarked from the aircraft. This was done so that the pilot would not have to sit in the sun while waiting for the other aircraft to be refueled. The lineman then positioned himself to accept the next aircraft the taxi director was assisting.

The taxi director suddenly received a frantic signal to look behind him from the pilot of the aircraft he was then directing. Turning around he saw the A-4 that had just been chocked rolling backwards down the slight incline leading from the fuel pit area to the taxiway. At the same time, a crewman from a nearby SAR aircraft noticed the A-4 moving. He ran for some chocks and twice attempted to stop the runaway *Skyhawk* by throwing chocks behind the main gear – the aircraft rolled over the chocks both times. About this time the taxi director reached the aircraft and also attempted to stop the aircraft with chocks – with the same results.

As the aircraft started a slow turn towards a SAR helicopter, the two men realized the danger of a collision and pushed on the nose of the A-4, causing it to accelerate its turn and miss the helo. It came to a stop shortly thereafter with no damage to either aircraft.

The chock was the apparent cause of the situation which developed. The rope which connected the two pieces of wood was too short, and when the chocks were placed around the nose gear, the wooden blocks could not rest perpendicular to the tire, and were at an open angle. This allowed the

nosewheel to roll free. This "short-coming" of the chock should have been noticed during manufacture or at least noticed by line personnel before this near-incident. Needless to say, we checked the remainder of our chocks immediately and rebriefed the linecrew.

Chockmouse

Whew! I'll tell you this, regardless of **who** *or* **what** *was responsible for the inadequate chocking; those two lads who directed the A-4 by nose-pushing were certainly heads up! They redeemed themselves in no uncertain terms, and at the same time, provided a good lesson for all of us. At one time or another we've all placed too much faith in those little wooden blocks. Proper chocking by the lineman and a quick check by the pilot debarking will insure, in such a situation, prevention of a needless ground incident . . .* **or worse!**

One Dark and Wandy Night

WE manned our "Fudd" for a late night CVS launch. I was the CAPC for the flight with a relatively inexperienced copilot in the right seat. Everything was normal as we went into tension on the port cat. I looked to the right and saw the green wand of the cat officer and put my head in the cockpit as I ran the engines to full power, gave two clicks on the ICS and flicked the lights on to signal we were ready to go. Head back – eyes on the gages.

It seemed like a long wait for the cat to fire, so, keeping my head on the headrest, I looked to the right but couldn't see the cat officer and assumed he was still down touching the deck. I tried to call the copilot on the ICS to ask if anything had happened, but evidently he couldn't hear me. Then he reached up and pulled the throttles back to idle. The air boss then made it very clear that I had made two big mistakes – putting the power on and not taking it off. Again we were tensioned and launched without further incident.

After our return, discussions with the cat officer, air boss and a member of the cat crew caused me several sleepless nights. In retrospect, when I *thought* I saw only a green wand, there was also a red one. Also, the green wand was not *really* moving back and forth. Probably the metal around the windows blocked the red wand from my view, but the result was that I added power *without* receiving the proper signal. At the precise moment the starboard engine went to full power, the holdback checker was directly behind it. Directly behind my E-1 was an S-2 whose prop was directly behind mine. The wind blew the checker down, but he was able to catch a pad eye and stop short of the S-2 prop. The cat officer then suspended the cat (as did the air boss) and ran to the copilot's window signaling to pull the power off. He beat on the window and the copilot was calling me on the ICS, the air boss was calling and I was calling the copilot, so nobody heard anybody. I couldn't see the cat officer since he was under the copilot's window. The copilot finally did pull back the power, but it seemed like a very long time.

Some points to ponder (and there are more than these):

- What if the checker hadn't caught the pad eye?
- Know the proper signals and respond to only them. When in doubt, stop until you *know*.
- *Really* brief the copilot.
- It is not necessary to keep one's head in the cockpit (or in any other dark place) while turning on the cat.
- Oh yeah? I didn't think it could happen to me either.

Muchwisermouse

Boy! This could have very easily ended up as a tragedy, with a holdback checker spread aft of the port cat all the way to the LSO platform.

It's real scary for those catapult personnel who have to work around props **any time** *– especially at night. Pilots can't afford to forget, for one second, the hookup man, the holdback checker or the catapult captain (who checks the pendant after tension).*

The catapult officer would rather have a pilot **delay** *on adding power than to be premature. We've seen more than one green shirt take that rough slide aft because a pilot* **thought** *the cat officer was winding him up. Thanks for sharing your "lesson learned."*

OF COURSE the possessor of the small voice is absolutely correct. The difference could be something overlooked or forgotten. It could be disregard for SOP or not following a checklist. It could be any of these or it could be all of them. Let's set up a situation and introduce some little things to see how, under certain circumstances, the routine can turn out to be something quite different.

First, we need a recipe.

Shipboard Recipe

Check the H-46 control boost system

Ingredients:

- 1 or 2 qualified pilots
- 1 briefing by maintenance on the purpose of the test
- 1 signalman (qualified LSE preferred)
- 1 AMS or AMH to observe gages in aircraft
- 2 men for tie-downs and chocks

Assumptions:

Knowledge of NATOPS and NWP41 series.

Take casually some knowledge of NATOPS manual for the H-46 and shipboard operations for engine turnup and rotor engagement. Mix with the requirements for a control boost system check for maintenance. Allow time for inspection and preparation. Carefully strap in one or two pilots and a gage checker, so that beating will not occur. Fold in ground power and, when signaled, initiate turnup. Let stand for a few moments while speed increases, then engage rotors and check control boost system. Time: 15 minutes.

Notice that the recipe is straightforward and does not indicate any complicated operations. There is no precooking or partial cooking, nor any shaking up of ingredients, nor any waiting between phases of the recipe.

Second, we need a cook to try it out.

An H-46 pilot aboard a SERVFOR ship was requested by maintenance to prepare the recipe. He was aided by an engineer, in the copilot's seat, and a "metalbender," behind the pilot, to observe the gages of the flight control boost system. The APP (auxiliary powerplant) and both engines were started. Upon receiving a clearance signal from the LSE the rotor brake was released and engagement begun. Boost pressure began to rise normally but rotor acceleration seemed faster than usual. The pilot retarded the condition levers slightly. As N_r reached approximately 70-80 percent the aircraft began to vibrate. Both engines were cut, and as the rotor speed decreased the helicopter began to shake

more violently. So violently, in fact, that neither person in the cockpit could rearm the rotor brake system and apply rotor braking. As the rotors slowed, the amplitude of vibrations decreased, and eventually the rotors coasted to a stop. Damage to the helicopter was substantial. Two aft rotor blade shock absorber pistons were sheared, parts of the aft rotor head were warped and cracked, three tie-down chains snapped and two tie-down adjustment devices were stripped from the attaching hooks. What spoiled the broth?

Investigation disclosed that not all of the highpoint tie-downs had been removed before rotor engagement. Additionally, some of the detachment personnel were not aware that this was a NATOPS requirement. The reason, of course, is that highpoint tie-downs restrict the capability of oleos and shock absorbers to dampen out dynamic forces. When this restriction occurs, a helicopter can enter ground resonance and shake itself to pieces. The LSE, before giving the OK-to-engage signal to the pilot, did not check all highpoint tie-downs released. (It was night and lighting was poor.)

The AAB recommended reiteration of safe shipboard handling and operating procedures and institution of a vigorous and continuing training program for helicopter support personnel. Various endorsers commented on the need for thorough preflights, adherence to NATOPS, an apparent laxness in flight deck discipline and absence of supervision.

One important factor in the ground accident, not discussed so far, concerns the failure of the shocks. The AAB pointed out that the shock absorber failures could have been caused by either material failure or maintenance personnel error. Their failure did contribute to the severe vibrations and airframe rocking which occurred. Although it is conjecture, it's reasonable to assume that if all highpoint tie-downs had been removed, there would have been just a little difference between the mishap and a successful boost system check. There also was very little difference between violent vibrations (no injuries) and the helicopter's self-destruction (possibly many injuries). One endorser commented, "Accidents of this nature can only be prevented by ensuring that all personnel . . . are fully qualified to perform their assigned tasks and that procedures set forth in the NATOPS manuals are complied with."

Throughout naval aviation history one of the more pleasant duty assignments has been detachment duty aboard a nonaviation ship. VO/VS pilots and crews of WW II vintage aboard battleships and cruisers performed vital ASW, reconnaisance and gunfire-spotting missions under a much more leisurely pace than the hectic tempo aboard a carrier. Similar advantages accrue to members of helicopter detachments today. Not that operations aboard nonaviation ships are problem free, but *usually* there is adequate time for maintenance and flight preparations. An article entitled "Family Affair" appeared in the April 1971 issue of APPROACH. In it the author discussed some of the problems of detachments aboard nonaviation ships. It was pointed out that in small "dets," more responsibilities must be undertaken by everyone in the detachment. The luxury of having specialists for all duties just doesn't exist. This means that superior performance of every duty becomes necessary. There is no "George" to leave it to. This also means that personal supervision is even more important than usual. Pilots and crewmen become cross-trained out of necessity and help each other do what has to be done. It's a simple case of working together for the good of the detachment. *It means performing work with the book as well as by the book.*

Some suggestions to enhance safety of detachment operations and improve readiness might include lectures, training sessions and discussions with both ship's company and "det" personnel on a regular basis. For example, after reporting aboard, a series of short lectures covering flight operations, deck handling, fueling, and rescue procedures would be very timely. The detachment needs to review the ship's crash and firefighting bill for helicopter operations. It would also be prudent to review the ship's flight operations instruction and helicopter rescue bill. Many times it would be advantageous to have shipboard personnel, associated with flight operations, attend detachment training sessions. Of course, the pilots and aircrewmen need to continue their daily NATOPS discussions. One other area in which extra dividends might accrue would be to include a short dissertation, by the detachment maintenance officer or the senior mech, on any discrepancies which had occurred to the bird the previous day – using the MIM to pinpoint the trouble and the fix. Be assured that additional training of both detachment personnel and ship's company is warranted.

Whatever plan is instituted, whatever procedures are invoked, ensure that it is accomplished on a regular basis. It will make a difference.

Snap judgment would be all right if it didn't come unsnapped so often.

Old Mac

The Constellation Virgo.

Letters

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Ace L.

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I'm sure that spray cans of hydraulic fluid would save the Navy money. Much hydraulic fluid is wasted by opening hermetically sealed one-gallon cans of the fluid almost every time struts need wiping down and then throwing away the remainder because of contamination.

If this product is available, kindly inform me so that we may expedite the purchase of hydraulic fluid in pressurized cans.

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The simple solution, if anyone cares, is to construct another turnup area much further removed from working spaces. Space for this is definitely available here. I care about my hearing and that of others and hope that the Safety Center cares too.

Going Deafmouse

• Rest assured that you are not alone in your concern for hearing loss and in your interest in noise reduction. Generally speaking, many bases could reduce the noise level from the cause you describe by simply pointing aircraft tailpipes away from base population. In some cases this would necessitate moving the exhaust deflector installations 90 degrees one way or the other, but the end result would certainly justify this means.

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Vol. 17 **approach** No. 5

RADM W. S. Nelson
Commander, Naval Safety Center

Our product is safety, our process is education and our profit is measured in the preservation of lives and equipment and increased mission readiness.

Contents

Departments

NavAir 00-75-510

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Subscriptions: Single copy 55 cents; 1-year subscriptions $6.00;, $1.50 additional annually for foreign mailing.

Printing: Issuance of this periodical approved in accordance with Department of the Navy Publications and Printing Regulations, NAVEXOS P-35. Library of Congress Catalog No. 57 60020.

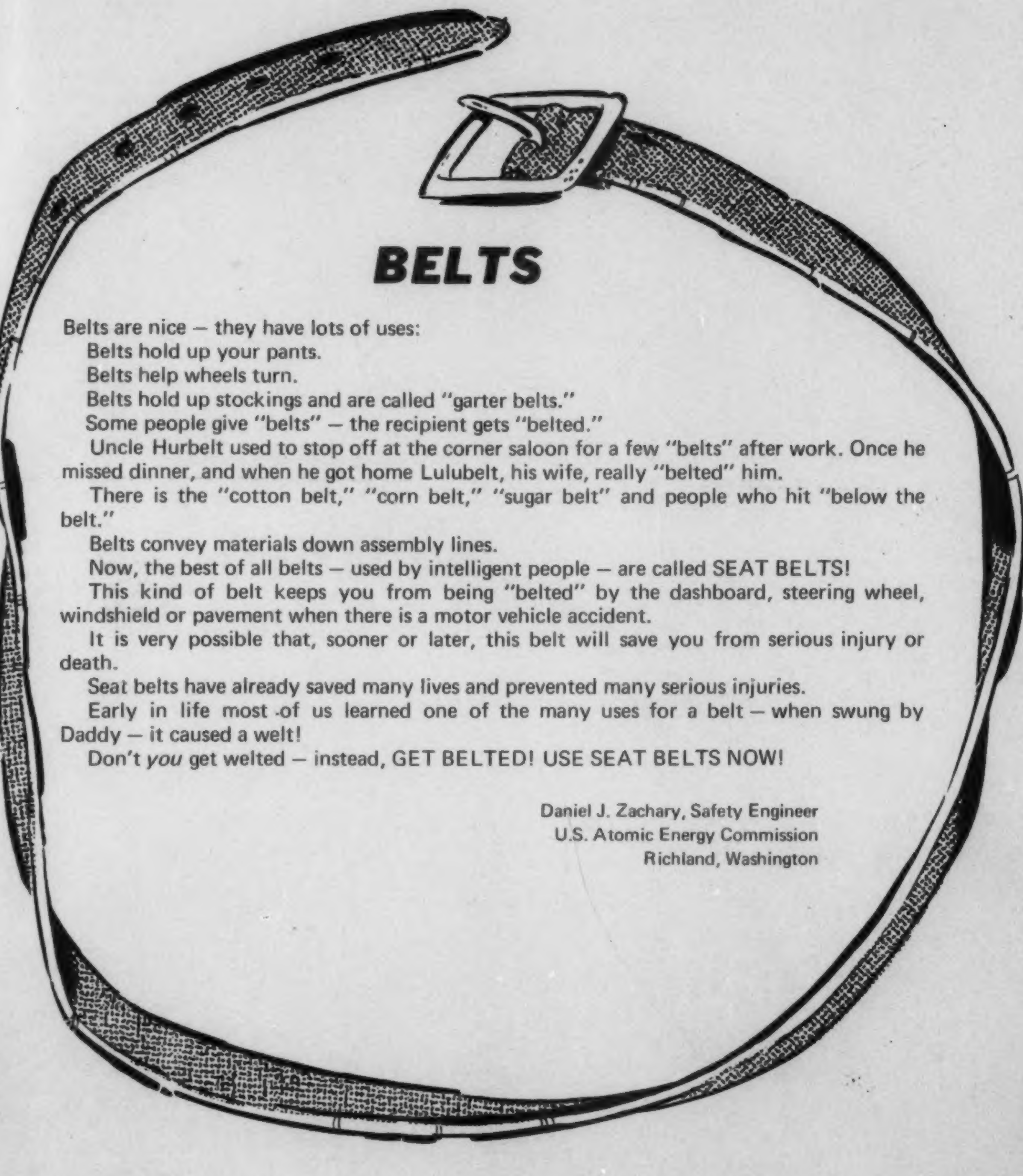
Credits

This month's cover painting by staff artist Blake Rader pays homage to the men who fly COD; a necessary task flying mail, passengers and freight to the Fleet. **Pg 10-12** Photos and diagram courtesy of the author. **Pg 18-21** Photos: Ph1 Ron Bartell, diagrams: Don Lips. **Pg 35** 'B.C.' by Johnny Hart courtesy the artist and Field Enterprises. **Pg 45** Photo: PH3 Charles Norden.

Errata: The outside back cover of the September issue should have read VA-203, vice VA-303.

Next Issue:

Sharing The Airways



BELTS

Belts are nice — they have lots of uses:

Belts hold up your pants.

Belts help wheels turn.

Belts hold up stockings and are called "garter belts."

Some people give "belts" — the recipient gets "belted."

Uncle Hurbelt used to stop off at the corner saloon for a few "belts" after work. Once he missed dinner, and when he got home Lulubelt, his wife, really "belted" him.

There is the "cotton belt," "corn belt," "sugar belt" and people who hit "below the belt."

Belts convey materials down assembly lines.

Now, the best of all belts — used by intelligent people — are called SEAT BELTS!

This kind of belt keeps you from being "belted" by the dashboard, steering wheel, windshield or pavement when there is a motor vehicle accident.

It is very possible that, sooner or later, this belt will save you from serious injury or death.

Seat belts have already saved many lives and prevented many serious injuries.

Early in life most of us learned one of the many uses for a belt — when swung by Daddy — it caused a welt!

Don't *you* get welted — instead, GET BELTED! USE SEAT BELTS NOW!

Daniel J. Zachary, Safety Engineer
U.S. Atomic Energy Commission
Richland, Washington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